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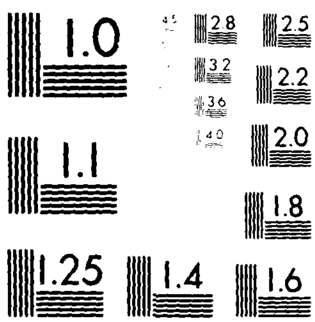

MICROCOPY RESOLUTION TEST CHART

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The Department of Defense

THE FY 1981 DEPARTMENT OF DEFENSE PROGRAM FOR RESEARCH, DEVELOPMENT, AND ACQUISITION

STATEMENT BY
THE HONORABLE
WILLIAM J. PERRY,
UNDER SECRETARY
OF DEFENSE
RESEARCH AND
ENGINEERING TO THE
96TH CONGRESS
SECOND SESSION
1980

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INDEX

THE FY 1981 DEPARTMENT OF DEFENSE PROGRAM FOR

RESEARCH, DEVELOPMENT AND ACQUISITION

Table of Contents

TABLE OF CONTENTS CONTINUED — Page No.

TABLE OF CONTENTS CONTINUED

TABLE OF CONTENTS CONTINUED Page No.

TABLE OF CONTENTS CONTINUED | Page No.

TABLE OF CONTENTS CONTINUED

TABLE OF CONTENTS CONTINUED

I. OVERVIEW OF THE FY 1981 BUDGET AND PROGRAMS FOR RD&A

Mr. Chairman and Members of the Committee:

I am privileged to appear before this Committee in support of the Fiscal Year 1981 budget request for the Defense Research, Development and Acquisition (RD&A) program. This is the third RD&A program and budget request that I have presented to the Congress. During this period, indeed during the decade of the 1970s, we lost ground to the Soviets in force modernization. But we are turning the corner, and if we sustain the momentum of the new five year defense program, the decade of the 1980s will show us, along with our allies, narrowing the gap in the quantity of equipment deployed, while maintaining a qualitative edge.

In this era of unprecedented change, technological strength is the key to our long-range survival as a nation. A strengthened and vigorous program in Defense RD&A is fundamental to the maintenance of stability and peace in the years ahead. The scope and composition of our program today will directly influence the balance of power in the 1980s and beyond.

I would like you to think in these terms as you consider my request for $57 billion for Defense RD&A in FY 1981. I believe this program to be composed with the boldness and vision which today's situation requires.

A. THE CHALLENGE

For years we have acknowledged that the Soviet Union held a quantitative lead in military equipment, but believed that our qualitative lead would more than compensate for this. It is time to re-examine that belief and to reject the

complacency that went with it. During the decade of the 1970s, the Soviet Union made a major advance in the development and production of defense materiel, and as a consequence will enter the 1980s in a dramatically different defense posture than they had as they entered the 1970s.

Their objective was to challenge the U.S. lead in defense technology while maintaining their numerical advantage. They have had a remarkable degree of success in achieving that objective by making an enormous investment, and by maintaining an unwavering emphasis on technology. The Soviet Union started the 1970s with an annual defense investment (RDT&E, procurement and military construction) approximately equal to that of the U.S. But they have increased at a steady rate of four percent per year since then, while the U.S. investment decreased in real terms every year until 1975. As a result, the Soviet Union invested over the decade about $240 billion (in FY 1981 dollars) more than the U.S. This differential exceeds the estimated acquisition cost (in 1981 dollars) of 1,000 F-16s, 1,000 F-18s, 10,000 XM-1 tanks, 20 CG-47 guided missile cruisers, 50 SSN attack submarines, 20 TRIDENT submarines (with missiles), the entire M-X program, and an additional $70 billion in R&D.

Generally speaking, they have used this investment increment to produce large quantities of equipment, thus maintaining their numerical advantage. But as they try to match the sophistication of U.S. equipment, the unit cost of Soviet equipment has substantially increased. For example, we estimate that the cost of their MIG-23 approaches that of our F-16.

Construction facilities represent a second component of Soviet investment. During the last five years of the 1970s, Soviet military production facilities have been constructed at the highest sustained level of the last two decades, portending high production rates and increased productivity during the 1980s.

The third investment component which can be used as an indicator of future plans is the Soviet R&D program. While our estimates of Soviet investment in R&D have significant uncertainties, the evidence is compelling that their program is about twice the size of ours. We can make a fair evaluation of this by observing their test programs, where we can identify about 50 major systems (ships, submarines, aircraft, and missiles) in various stages of test and evaluation. Some of these systems are quite significant--a new attack submarine, a new interceptor, a new look-down/shoot-down missile, a new SLBM. Also, we can assess some portions of their technology programs; by observing laser test activity, for example, we estimate that their high energy laser program is about four times the size of ours. Overall, during the decade of the 70s, the Soviets invested about $70 billion more than we did in Defense R&D. It is quite clear that their R&D program has had the highest priority access to funds, to trained personnel and to scarce materials, to the extent that they have imposed serious hardships on their non-defense industry. As a result, their non-defense industry is not competitive in world markets.

In sum, we see the Soviets entering the decade of the 1980s with a commitment to compete in quality with U.S. weapon systems. A

major start has already been made in that direction, with the acceptance of the much higher unit cost implied by this commitment. They are accepting this increased unit cost without decreasing their traditional emphasis on quantity, simply by increasing their total investment in weapons production to where it is now 85 percent greater than ours. That they plan to continue this emphasis throughout the 1980s is made clear by the major increases made in the 1970s in production plants and in defense RDT&E.

B. OUR INVESTMENT STRATEGY

The challenge ~~described in the previous section~~ ahead is formidable. We are behind quantitatively in deployed equipment and are falling further behind because of disparities in equipment production rates. While we are still ahead in defense technology, we are in danger of losing that advantage because of massive Soviet spending in defense R&D. But we also have some distinctive advantages: a superior technological base, a competitive industry with greater productivity, and allies with a substantial industrial capability. In order to meet the formidable challenge we face, our investment strategy must fully exploit these substantial advantages.

Our overriding near term need is to get on with the modernization of our forces. Our technology is of little use to our armed forces when it is not embodied in operational equipment. Most of our ground forces weapon systems now deployed--our main battle tank, our armored personnel carrier, our air defense gun and missile, our attack

helicopter--were developed during the fifties and entered production in the sixties. As a consequence they simply do not incorporate current technology, and they provide maintenance and support problems created by their age.

Fortunately, a new generation of weapon systems was developed during the seventies and is now ready for production. The preponderance of these new systems coming into production at the same time will cause a "procurement bulge" during the first half of the eighties. I see no way of avoiding this. We have examined all of these new systems in great depth; they are needed and they are not "gold-plated." The first and foremost component of our investment strategy will be to produce these new systems in an orderly and efficient manner. This includes: 1) equipment already in production--a new nuclear submarine and missiles (TRIDENT), new ships (destroyers, frigates, and cruisers), and tactical aircraft (F-15, F-16, F-18, and A-10); 2) equipment just entering production--a new main battle tank (XM-1), utility helicopter (BLACK HAWK), Fighting Vehicle System (FVS), laser guided projectiles (COPPERHEAD), air defense systems (PATRIOT and ROLAND), and the Air Launched Cruise Missile (ALCM); and 3) equipment which will be ready for production in a year or two--a new air defense gun, multiple launch rocket system, air-to-ground missile, ASW helicopter, and attack helicopter.

Our industrial base has the capacity to produce these new systems. The challenge is to provide stable and effective program management in the face of this rapidly expanding workload, and to

provide adequate procurement funds so that new systems can be produced at efficient rates--in short, to provide a steady hand on the helm. We have requested a five percent real growth in procurement funds in FY 81 and have programmed a seven percent average annual real growth in our five-year program to accommodate this "bow wave" of new programs.

The second component of our investment strategy is to meet the Soviet challenge in technology. In spite of the Soviet two to one advantage in R&D spending, we have been able to maintain technological leadership in most critical areas for three quite different reasons:

(1) We had enormous momentum in defense technology derived from the lead we built up in the 1960s, and, in effect, could "live off the fat" for a few years (but not indefinitely);

(2) The Soviet system responds well to increased funds and priority in evolutionary programs, but does not rise to innovative challenges. For example, they have been quite successful in increasing production on the FLOGGER aircraft (MIG-23), which embodies significant, but principally evolutionary, improvements in technology over previous aircraft; but they are still copying the U.S. (with a lag of five years or more) in the revolutionary developments we have made in computers and micro-electronics.

(3) We have a tremendous asset in our commercially-oriented high technology industry, for which there is no real equivalent in the Soviet Union. A comparison of defense RDT&E budgets does not reflect the considerable effort expended by U.S. companies with their

own funds or independent R&D funds--efforts which have led to technological advances of fundamental importance to advanced weapon systems. For example, the microprocessor, which plays a key role in our new generation of precision guided weapons, was basically a commercial development.

For this combination of reasons, the U.S. still maintains leadership in the underlying technology critical to defense. But our technological advantage in deployed equipment is eroding, especially in weapons for the ground forces, where the bulk of our deployed equipment was built in the 1960s and the bulk of the Soviet deployed equipment was built in the 1970s. Therefore, our investment strategy involves increasing our R&D in the 1980s, with emphasis on those technologies which can produce a distinct military advantage. We are requesting a 13 percent real increase in RDT&E for 1981, with a major increase in the application of technologies such as microelectronics (the VHSIC program), computers and microprocessors (applied to a new generation of precision guided weapon systems), and advanced materials (improving the performance of aircraft, helicopters, missiles, and jet engines).

C. RD&A PROGRAM EMPHASIS FOR THE 1980s

The 1980s threaten to be a period of growing international tension and danger for the U.S. if the Soviet Union continues its military buildup and its aggressive attempts to expand political influence. A primary objective of our force modernization is to provide a military capability with strength sufficient to deter or counter those aggressive actions. In that regard, five specific areas of emphasis should be

noted: we must maintain unambiguous nuclear deterrence; we must greatly improve our anti-armor capability; we must improve our ability to deploy forces rapidly; we must maintain our tactical air superiority; and we must maintain our naval superiority. *Specific RD&A thrusts are planned* to achieve each of these objectives.

1. Maintain Nuclear Deterrence

If the 1980s continue as they have begun, we will find our political will tested and our military forces deployed to deter aggressive actions. In these dangerous circumstances, it is of utmost importance that there be no doubts as to the strength of our nuclear deterrent forces. Therefore, we have underway a vigorous modernization program to strengthen these forces and to maintain their survivability in the face of the Soviet's increasing counterforce capability. During the 1970s, the Soviets embarked on a major expansion of their strategic forces, which will threaten the survivability of our forces in the 1980s. They have increased the number and accuracy of their ICBM reentry vehicles, so that by the early 1980s they will be capable of destroying most of our Minuteman silos. They have developed new air defense systems that may threaten our penetrating bombers by the mid 1980s. And they are in the early development phase of new submarine detection systems which by the early nineties could have some level of effectiveness against our current nuclear submarines.

Our modernization program is designed to deal with these problems, although not all at the same time or with the same effectiveness. We are introducing a new, longer range missile (the C-4) into our

submarine forces which will allow our submarines to increase their patrol area by a factor of ten, and we are introducing a new submarine (the TRIDENT) which is quieter than its predecessor. These combined measures will be deployed before the potential new Soviet ASW system could be operational, giving us high confidence in the continuing survivability of our submarine launched ballistic missiles.

We are introducing air-launched cruise missiles as the major weapons on our bomber force. This will allow the carrier aircraft to standoff and deliver weapons rather than requiring it to penetrate the increasingly capable Soviet air defense. We have demonstrated in a series of tests that the cruise missile, by virtue of its low detectability and large numbers, will be able to penetrate the Soviet air defense. Our cruise missile will be deployed before new Soviet air defense systems are available in significant quantities.

We are proceeding with full-scale development of the M-X missile, which will achieve survivability by distributing 200 missiles among 4600 protective shelters so that the Soviet war planner will not know which shelters to select as aim points. The M-X system will not achieve IOC until 1986, whereas the Soviet ability to attack Minuteman will occur in the early eighties. During that "window of vulnerability" we will place a greater reliance on the bomber and submarine forces to maintain our deterrence; indeed, the primary reason for having a Triad of strategic systems is because each of them becomes vulnerable in different ways and at different times, thus complementing each other.

Finally, I would note the major new deployment of SS-20s in the Soviet Union directed against Western Europe, Japan and China. In order to offset the resulting imbalance in theater nuclear forces, we have agreed with our NATO allies to deploy, in Europe, the Ground-Launched Cruise Missile (GLCM) and Pershing II, a longer-range version of the Pershing Ia ballistic missile. We will deploy Pershing II at a force level of 108 launchers and GLCM at a level of 464 missiles on 116 launchers beginning in 1983.

These programs are expensive. We plan to nearly double our investment in strategic programs in the eighties, in comparison to our investment in the seventies. However, even these increased costs are only slightly more than half of what the Soviets are spending on strategic forces or, for that matter, about half of what we spent (in real terms) in the sixties when we were building our first generation strategic systems. These programs do not represent major technological challenges; rather their success will depend on our consistent affirmation of their priority, and our unwavering management commitment to maintaining program schedules.

2. Improve Anti-Armor Capability

The Soviet ground forces have more than a three to one advantage in armored equipment over the U.S. Even when allied forces and the diversion of Soviet forces to Asia are taken into account, the disparity is large and will not be overcome during the 1980s because of the momentum of ongoing Soviet production (more than 2,000 tanks and about 5,000 other combat vehicles are being produced each

year in the Soviet Union). Moreover, the quality of these weapons is excellent. For example, the T-72 tank and the BMP infantry fighting vehicle are superior in quality to any comparable system now deployed with NATO forces, and will challenge our new systems just entering production. Therefore, we need some way of offsetting this advantage.

Fortunately, the technology of microelectronics--a technology in which we are pre-eminent--is creating a revolution of major proportions, leading to precision guided weapons which will have very high effectiveness against armored vehicles. This revolution involves surveillance systems that will detect, identify and locate targets; command and control systems that will pass that target information on to fire units in near real time; and precision guided weapons that can make a direct hit on the designated target.

The new family of surveillance systems now being developed represent a major improvement over the reconnaissance cameras of WWII. New sensors include infrared detectors, radiometers, and radar imaging devices which extend surveillance to nighttime and poor weather. These sensors are located on reconnaissance platforms such as satellites, drones, or manned aircraft, and their output is converted to a stream of numbers and transmitted in "real-time" to fire control centers via digital radios, making target identification and location data immediately available. In contrast, reconnaissance cameras require several hours to retrieve and process the film, and then identify targets, which, by then, could have moved to different locations.

Once the target data are determined, they will be transmitted to tactical fire units (attack aircraft or artillery units) who also need precise information on their <u>own</u> location. Presently, position information for our own units comes from inertial navigation systems, or surveying; in the future it will come from radio navigation satellites which will enable units to accurately and instantaneously locate themselves anywhere, anytime.

Our tactical units will also have a digital radio system for passing the data around among tactical units, so that every unit will know at all times his own location, the location of friendly units, and the location of targets. This "situation awareness" will play a major role in the ability of tactical units to attack enemy units and to avoid being attacked themselves.

With this greatly increased "situation awareness," we will also have the revolutionary improvements in firepower brought about by the new "zero CEP" weapons. These are weapons which can, with their first round, make a direct hit* on the target. Compared to the barrage weapons now deployed in tactical units (artillery rounds and bombs), they are enormously more effective and reduce logistical support requirements manyfold. The first generation of these precision guided munitions (PGMs)--laser guided bombs and wire-guided anti-tank missiles--are already in inventory. The second generation (laser guided projectiles

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* More accurately, their miss distance is less than their lethal radius.

and missiles) has been under development during the 1970s and will be going into inventory in the early 1980s. These second generation systems significantly extend the application of PGMs, but still have the same basic operational deficiencies--weather limitations, vulnerability of the designator to attack, and susceptibility to relatively simple countermeasures (e.g., smoke).

A major priority in our R&D program is the expedited development of a family of third generation PGMs which overcome (or mitigate) these disadvantages. The new systems will use millimeter wave radar or long wave infrared sensors, thus extending their range of operation to night and poor weather; they will be "fire and forget," thus reducing the operator's vulnerability; and they will be more difficult to counter. We will be developing these new weapons for delivery in artillery projectiles, in bombs, and in missiles. The missiles will range from a hand-held system which allows a foot soldier to engage a tank at a range of roughly one mile, to a large missile which carries a cluster of these PGMs for engaging formations of tanks at much greater ranges.

Our acquisition plan will be to continue the production program now underway to get the second generation systems deployed as quickly as possible. But we will produce them in limited quantities, since we are expediting the development of the revolutionary third generation systems in order to achieve IOCs by the mid-80s. It is the third generation systems that will give us a truly competitive edge in ground combat.

3. Improved Capability to Deploy Forces Rapidly

The most demanding contingency considered in U.S. defense planning is a war between NATO and the Warsaw Pact, accompanied by a conflict in non-European areas (e.g., the Middle East, Persian Gulf or Korea). The speed with which we can deploy our mobile forces and the strength and staying power of those forces after deployment must be improved to meet potential demands for NATO and non-NATO contingencies. To achieve our objectives, we plan to add significant airlift capability, and improve our ability to establish presence in contingency areas through deployment of shipborne prepositioned materiel.

Our airlift capability needs improvement in three respects: first we need to double our capacity; second, in the course of doubling this capacity we will put a heavy emphasis on outsize cargo capability so that we can carry tanks, armored personnel carriers and other mechanized equipment; and third, this new airlift capability must have the flexibility to operate at small, austere airfields. We believe that is true whether we're dealing with a Persian Gulf contingency, or the threat of war to NATO. For that reason, we will be proceeding this year with the development of an airplane providing these capabilities. The airplane, called C-X, will be somewhat heavier and certainly wider than the C-141, but smaller than the C-5A. It will not require the application of advanced technology, so we should be able to use commercial acquisition practices, allowing us to achieve an operational capability by 1985.

Even with this increased airlift, we will have to increase the practice of prepositioning heavy equipment in areas of the world where we think it might be needed. Then, in an emergency, we need only to move troops into an area where they will join their already present tanks and armored personnel carriers. The prepositioning program has been underway for several years in NATO, and we have several divisions of armored equipment stored at various warehouses and storage depots in Europe. That program will be continued and enhanced so far as NATO is concerned, but we need something comparable in the Persian Gulf as well. Our problem is that we don't have sufficient real estate, depots, or warehouses in that area. So we will be developing a shipborne prepositioning capability. We will be getting large cargo ships, outfitting them with armored mechanized equipment and positioning them near the Persian Gulf. In an emergency we could move that equipment in a matter of a few days to the crisis area to join with personnel who will be flown in.

4. Maintain Tactical Air Superiority

The Soviets continue to modernize their air forces with late model MIG-21 (FISHBED), MIG-23 and 27 (FLOGGER B/G and D), SU-17 (FITTER C/D/G/H) and SU-24 (FENCER) aircraft. The majority of the fighter force in Frontal Aviation now consists of these aircraft. Because of their range and payload, these aircraft give the Soviets--for the first time--the capability for deep interdiction and air superiority missions.

However, the present Soviet fighter force suffers from two key deficiencies: 1) the lack of an effective fighter and missile with a look-down/shoot-down capability, and 2) the lack of an airborne warning and control capability to detect our aircraft over land and vector their fighters in response.

These deficiencies have provided a sanctuary for our tactical air forces when they operate at low altitude in ground clutter. But the Soviets are working actively to remove this sanctuary. They are developing an airborne warning and control capability and have already tested an interceptor with a look-down/shoot-down capability. While this sytem has limitations which would significantly limit its operational capabilities, it represents a major step forward.

To maintain tactical air superiority, we will proceed with procurement of the F-15, F-16 and F-18. We are proceeding with the highest priority to develop the Advanced Medium Range Air-to-Air Missile (AMRAAM), which will be compatible with the F-15, F-16 and F-18. The AMRAAM will provide the capability to attack targets beyond visual range. A "launch and soon leave" capability will allow our aircraft to obtain multiple kills on a single pass, while minimizing exposure to hostile aircraft.

5. Maintain Naval Superiority

I believe that our naval forces today are significantly superior to those of the Soviet Union--in quality, in firepower, and in operational flexibility. But this superiority is partially offset by the greater geographical demands imposed by worldwide commitments

of the United States. Also, we note that the Soviet navy is rapidly increasing its "blue water" capability, in a sense emulating the United States Navy as they move to nuclear guided missile cruisers and aircraft carriers.

During the decade of the eighties, there are two areas in which RD&A emphasis will play a key role in maintaining U.S. naval superiority: improving our anti-air warfare, especially against cruise missile attacks; and maintaining our advantage in submarine detection and submarine quieting.

To enhance our shipboard anti-air capability, we are requesting two Aegis guided missile cruisers in 1981 and are projecting a total of 16 over the five-year program. But we also need to improve our anti-air capability on other carrier escort ships, so we will embark on an R&D program to provide the DD-963 class of ships with a superior anti-air capability based on Aegis technology. A program which indirectly provides an anti-air capability is the sea-launched cruise missile (SLCM) with a conventional warhead. The land-attack SLCM will be used to interdict land airbases, thereby reducing the threat with which the ship air defense system must deal. We are starting production of the land-attack SLCM this year for deployment on ships and submarines.

We continue to maintain superiority in the capability of our submarines because they are substantially quieter than their Soviet counterparts and because we have a superior technology in acoustic sensors and processing. We will maintain this lead by continuing our

emphasis on quieting, and by pulling even farther ahead in acoustic processing. We intend to continue converting our advantage in computers and signal processing technology into a growing advantage in submarine detection, so that our submarines will be able to detect Soviet submarines (and take appropriate action) long before the Soviet submarine is aware of our presence.

D. RD&A MANAGEMENT EMPHASIS FOR THE 1980s.

The size and complexity of our RD&A program ($16.5 billion in RDT&E and $40.5 billion in procurement) makes it difficult to manage. But that very size argues that the rewards will be great if we can improve our management; in particular, if we can reduce acquisition costs and reduce delays in fielding equipment. In order to achieve these objectives, we have undertaken a series of management initiatives to:

- Increase Competition
- Use Technology To Reduce Manufacturing Costs
- Stretch The Life Of Existing Systems Through Product Improvement
- Increase Cooperation With Our Allies
- Use Tailored Procurement Procedures

These initiatives were described in some detail in last year's report and will not be repeated here. Also, it is premature to assess how successful we've been since many of these initiatives have been underway for less than one year. I plan to give a full account of them in next year's report.

However, it is appropriate to give a brief status report on each of them.

1. Increase In Competition

The Department of Defense experienced during FY 1979 the first upturn in a decade in the percentage of contracts awarded after price competition. The rate for awards after price competition rose from 25.7 percent of all purchases in FY 1978 to 27.3 percent in FY 1979. This increase resulted from a $2 billion increase in competitive contract awards during 1979. Ship procurements accounted for the principal increase, more than offsetting the continuing decline in competitive procurements for petroleum products.

Another way to look at the DoD competitive versus non-competitive procurement balance is to compare the rate for sole source awards with the sum of rates for competitive or competitively derived procurements--those with price competition, technical competition, and follow-on awards (where the source was initially obtained through price or technical competition). Such an evaluation shows that during FY 1979, DoD awarded 54.2 percent of its contracts on a competitive or competitively derived basis compared to 53.1 percent in FY 1978.

There are a number of factors that affect competition. Acquisition strategies for major systems developed many years ago are reflected in current statistics measuring competition. Systems such as nuclear submarines and aircraft carriers offer limited competitive opportunities; scarce commodities like petroleum products frequently offer little or no competitive opportunities. However, I expect

continuing increases in the competitive procurement rate as our initiatives for establishing continuing competition in production begin to make their full effect felt. The cruise missile program, for example, has now been structured to have dual production sources for every major subsystem, and that will provide an intensely competitive environment from 1981 to 1985 when the production is at its peak. A new competitive acquisition approach was used with the Advanced Self-Protection Jammer (a new countermeasure system) wherein teams of two companies competed for the development phase; the winning team will develop the system, then each of the companies on the developing team will compete for the production award (that maintains competition without going to the expense of maintaining two parallel development teams).

2. Use Technology To Reduce Manufacturing Costs

Technology is being used as a tool to achieve major cost reductions in manufacturing complex weapons systems and high-quality-production hardware in several important ways: improvements in productivity and yield (e.g., computer-aided manufacturing), conservation of strategic materials resulting in reduced production lead times and costs (e.g., "near-net shape" fabrication methods and substitution with less critical materials and composites); greater producibility (e.g., improvements in safety, pollution abatement, and energy use); and enhanced quality and reliability through improved inspection and quality assurance methods. The Manufacturing Technology Program, a top priority program for increasing the introduction of innovation in the defense industrial base, is funded at $150 million

in FY 1981, representing approximately 0.4 percent of the defense procurement program. Examples of major cost reductions which have been achieved by recently completed projects are the following:

- Ships Beam Bender - This prototype 37 ton device, capable of bending a steel beam to an accuracy of one-fourth inch, will reduce the cost per bend from the current \$200 to \$12.

- Precision Casting of Titanium - A precision, near net shape, centrifugal titanium casting--which replaces a two piece forged and welded component in a turbine engine--will result in cost savings of \$990 per unit through improved productivity.

- High Resistivity Silicon - The only viable source of high-resistivity silicon used for seekers in precision guided munitions has been off shore. As a result of a tri-service effort, we have established the manufacturing technology to produce high resistivity silicon domestically. This technology reduces the cost from the 1975 foreign source price of \$28 per gram to \$10-15 per gram.

- Pollution Abatement - An investment of \$632,000 in a new water recycling process has eliminated the need for an \$11 million pollution abatement facility at an Army ammunition plant. There are 17 additional TNT production lines which can use this process.

- Fiberglass Radomes - The substitution of foam filled radomes for honeycomb radomes has provided increased performance, and a cost reduction from \$6,000 to less than \$600 for Phalanx search and track radomes. More than \$4 million cost avoidance is projected based on scheduled procurements through 1984.

Similar cost reductions and improvements in equipment and material utilization are expected to result for all major categories of defense commodities as a result of planned FY 1981 manufacturing technology projects.

3. Stretch The Life of Existing Systems Through Product Improvement

In addition to our major modernization program, we have programs underway to improve existing systems to extend their useful life. Instead of developing and building a new family of heavy lift helicopters we are modernizing and extending the capabilities of the CH-47 and the CH-53; we are greatly extending the capability of existing artillery tubes with the development of the Copperhead Laser Guided Projectile, which will allow the 155mm howitzer to perform the function of a guided missile; we are extending the useful life of the B-52G by at least 10 years by developing a long range weapon (the air-launched cruise missile) which allows the B-52 to perform its mission without penetrating Soviet air defenses; and we have enhanced the capability of the M60 main battle tank by adding a night vision device, and a new fire control system with a laser rangefinder. We are also considering improvements to the Chapparal missile, Vulcan air defense gun, Cobra helicopter and UH-1 utility helicopter.

Product improvements of this type extend the capability of our forces by giving improved capability to old systems until the new systems now being developed and produced can replace them. In many cases we will keep the older systems in our forces even after the new systems are deployed, thus achieving a "high-low" force mix. THe XM-1 tank, for example, will comprise less than half of our main battle tanks, even after all 7,000 units are built and deployed, so the

product improvements in the M60 tank will affect overall force capability for the rest of this century.

4. Increase Cooperation With Our Allies

Three major initiatives were instituted last year to improve cooperation in armaments development and production, and there has been substantial progress in those initiatives. We have now signed agreements with most of our NATO allies which allow the defense industry of the U.S. to compete for defense programs with our allies, and vice versa. This is intended to assure that the best technology is available in deployed systems. We have also provided data packages for advanced systems under production in the U.S. so that they may be produced by a consortium in Europe. The AIM-9L and MOD FLIR have already been transferred and a dozen more are under discussion. This assures that the best systems developed in the U.S. are also available for use by the Allied armies on our flanks, and that efficient production rates are effected by the establishment of a single production line in Europe. We have begun cooperative development programs on several weapon systems and have more under negotiation. Cooperation in the development phase has reduced redundant expenditures in R&D and allowed U.S. and European R&D dollars to be combined so that we can compete more effectively with the Soviets.

5. Use Tailored Procurement Procedures

A number of programs that entered development in the late 1960s or early 1970s have taken 10 to 15 years to reach operational capability. Such long development periods can result in deployed

systems embodying obsolete technology--even in the early phases of their deployment--thus limiting the extent to which the U.S. technological advantage can be exploited in the performance of our deployed systems. During the latter half of the 1970s, with the encouragement of the Congress, we began the development of systems using accelerated procedures, and many of these programs are nearing completion. For example, the XM-1 tank, the DIVAD gun, the General Support Rocket System and the Air Launched Cruise Missile, are all structured with controlled concurrency, reducing to five or six years the period from development to operational capability. These programs are now entering production, and by all indications, will be successful. We plan to use similar accelerated acquisition procedures on the TR-1 program, the C-X program, and the AMRAAM.

Great care must be taken in the selection of programs for accelerated acquisition procedures. Technical risk must be low, and special management auditing must be used to get early warnings of trouble. We were using accelerated procedures on the HARM missile, for example, and when developmental problems arose, we cancelled plans to begin concurrent production. We also experienced test problems on the XM-1 tank and kept the concurrent production at a low rate until we were able to incorporate fixes and retest the modified tank.

The benefits that can be achieved from a tailored procurement process are great, but these benefits come at the cost of increased risk, and the need for extraordinary attention to management auditing of the program. We plan to continue using accelerated

acquisition procedures for those programs in which the benefits outweigh these costs.

E. THE FY 1981 RD&A PROGRAM

1. Strategic Programs

Our strategic RD&A program is geared to address Soviet capabilities which will change markedly during the next decade. The program must insure that we always have the capability to deter attacks or threats of attacks, at any level, against ourselves or our Allies. To provide credible deterrence, our strategic forces are structured so that we can: 1) maintain a second-strike capability sufficient to attack a comprehensive set of targets--military, political and economic; 2) maintain the capability to destroy, at all times, a sizeable percentage of the Soviet economic base; 3) withhold retaliation against pre-selected sets of targets; and 4) maintain a strategic reserve force for a substantial period after a strategic exchange. To maintain credible deterrence in the face of an adversary who may attempt to destroy or defend against the components of our strategic forces, we plan to maintain our TRIAD of strategic offensive forces including ICBMs, SLBMs and bombers.

The growth in Soviet strategic capabilities will provide them, within a year or so, with ICBM re-entry vehicles (RVs) sufficient in both numbers and lethality to place the ICBM component of our strategic TRIAD at risk in a surprise attack. The value of the TRIAD is evidenced by the resistance of the other two components, both now and in the near future, to such an attack. To maintain the TRIAD in the

future, we will proceed with the mobile M-X program to restore the survivability of the ICBM component; we will also continue with our planned modernization of the other two components.

In FY 1981, we will continue full scale development of the M-X system, including the missile and its associated basing mode. Survivability, the unique feature which M-X brings to our ICBM force, underlies both credible deterrence and stability. In addition to M-X, which will achieve Initial Operational Capability (IOC) in 1986, we will continue to deploy the Mark-12A RV on MINUTEMAN III ICBMs. We are also improving the flexibility and capability of our MINUTEMAN Airborne Launch Control Centers (ALCC).

The SLBM force continues to be the TRIAD element in whose survivability we have the greatest confidence; the modernization program underway will maintain our confidence in its survivability. The TRIDENT (C-4) SLBM has already been backfitted into the first two POSEIDON SSBNs; the remaining ten will be completed by the end of FY 1982. The first TRIDENT SSBN will be operational in FY 1981, with four more deployed by December 1985; the ninth TRIDENT submarine is funded in the FY 1981 budget. We are proceeding with research and development on the TRIDENT II SLBM, retaining the option to deploy, in the TRIDENT SSBN missile launch tubes, an SLBM with higher accuracy and a larger payload than available with TRIDENT I.

We are improving the reliability and maintainability of the B-52 bomber and are moving ahead rapidly with the Air Launched Cruise Missile (ALCM). The ALCM competitive flyoff has been completed

and we are continuing with our plans to achieve an ALCM IOC in December 1982. We are also retaining the option of having a new Cruise Missile Carrier Aircraft ready for service should the need arise.

Our strategic command and control capability will be structured to provide the survivability and endurance required by our strategic forces. The system must provide survivable, jam-resistant and secure means of communication between the National Command Authorities and the strategic forces. Key efforts include acquisition of the E-4B, an improved Advanced Airborne Command Post; development of command, control and communications for the M-X missile force; improving the survivability and endurance of the World-Wide Military Command and Control System (WWMCCS); improvements in strategic satellite communications (AFSATCOM); and both upgrading and expansion of the TACAMO aircraft fleet to improve communications with our SSBN force.

Because our strategic offensive forces bear the principal burden of deterrence, our defensive programs have generally been structured to provide a limited, but meaningful level of activity to provide effective options should they be needed in the future. They also provide the surveillance and warning capabilities essential to characterize and react to an attack should deterrence fail. Our BMD technology provides the options to deploy various BMD alternatives in the future should we deem it necessary. We are developing and demonstrating new sensors and guidance techniques for attacking RV's outside the Earth's atmosphere, and are continuing R&D on a ballistic missile point defense

system that could protect our ICBMs, bomber bases or critical C^3 assets. Our air defense will continue to rely on a variety of dedicated active and Air National Guard squadrons, augmented with additional tactical fighters as needed. Programs for warning and detection include survivability enhancements for our satellite early warning system and attack-characterization improvements to the BMEWS, PARCS, and PAVE PAWS ground-based radars. In crisis and wartime, we will augment ground-based radars with E-3A (AWACS) aircraft for bomber attack warning and command-and-control of air defenses. While we have stated our preference for verifiable limitations on anti-satellite (ASAT) systems, we are proceeding with development of an ASAT capability, and are pursuing technology to reduce the vulnerability of our satellites to the existing Soviet ASAT capability.

2. Tactical Programs

During the past decade we had planned for the capability to deal simultaneously with one major and one minor conflict. In doing so, we depended heavily on our allies to man forward defenses in peacetime, relying on a CONUS-based reinforcement capability composed of ground and tactical air forces, with naval forces for power projection and sea control. While we never fully acquired the readiness and mobility resources required to support this strategy, we were not penalized, largely because of the limitations of our potential adversaries. But times are changing. The Soviets now possess the capability to project power at great distances; they continue to improve their ability to operate naval units, aircraft and resupply forces far from their shores.

We can no longer discount their capability to operate simultaneously in several parts of the world. Consequently we need to significantly upgrade our tactical force capabilities.

We plan to upgrade significantly our Theater Nuclear Force (TNF) capabilities, including both battlefield and long range systems, and the associated security, survivability and C^3I. To modernize our battlefield systems, we will continue to produce LANCE warheads, maintaining the option for including an enhanced radiation (ER) feature. We are just entering production of a new 8" artillery round, with a new 155 mm round in engineering development. To upgrade our long-range TNF we have both the PERSHING II and the Ground Launched Cruise Missile (GLCM) in engineering development. Both systems will provide the capability to reach the Soviet Union from NATO Europe, with high accuracy warheads capable of striking the hardest targets while minimizing collateral damage.

To improve the combat capability of our land forces, we are proceeding with a major modernization program in almost every category of Army equipment. Tactical surveillance, reconnaissance and target acquisition systems such as SOTAS (a heliborne radar), REMBASS (battlefield sensors) and the Remotely Piloted Vehicle will provide the field commander with timely and accurate information on the deployment of opposing forces. Close combat capabilities will be substantially improved as the XM-1 tank enters service; future capabilities will be advanced with development of the VIPER light anti-tank weapon, an Advanced Attack

Helicopter, the HELLFIRE missile, the Fighting Vehicle System, and a high mobility weapons carrier. Fire support programs, such as the COPPERHEAD precision-guided projectile and the Multiple-Launch Rocket System (MLRS) will transition into procurement in 1980, providing complementary weapons that, in combination, will improve our capability to counter massed armor attacks. Our family of air defense equipment will be upgraded with four new systems: the PATRIOT, ROLAND, and STINGER Missile systems and the DIVAD gun.

In air warfare, continued procurement of the F-14, F-15, F-16, and F/A-18, coupled with production of the AIM-7M SPARROW, AIM-9M SIDEWINDER and AIM-54C PHOENIX missiles will maintain our current advantage in air superiority. Development of the new Advanced Medium-Range Air-to-Air Missile (AMRAAM) is aimed at sustaining that advantage in the future, providing the capability to attack multiple targets beyond visual range. We are also working to close enemy air fields, with programs (such as JP-233) designed to crater runways and slow their repair.

Continued procurement of the A-10 and F/A-18, along with development of the LANTIRN designator pod, Imaging Infrared MAVERICK, ASSAULT BREAKER and the Wide Area Anti-Armor Munitions will improve our ability to support ground forces in defeating massed armor attacks. We are also developing improved standoff weapons, for example the conventionally-armed land attack TOMAHAWK (TLAM-C), the Medium Range Air-to-Surface Missile (MRASM) and the GBU-15, to attack high value targets with reduced attrition. The HARM anti-radiation missile, now entering pilot

production, will improve the survivability of our aircraft in a dense air defense environment.

To counter the future threat, our Naval forces will need improvements in fleet air defense, anti-submarine warfare (ASW), and anti-ship warfare. Improved fleet air defense will be provided by accelerated procurement of AEGIS ships, along with improved SM-2 missiles to provide longer range intercept and improved lethality. Short range defense will be improved with continued procurement of the Phalanx gun system and the Improved Point Defense (IPD) missile system. Improved ASW capabilities will result from the development of towed array sonars (TACTAS, SURTASS) and procurement of associated T-AGOS ships, pilot production of the LAMPS MK III helicopter, improved torpedoes (MK 48 improvements and Advanced Lightweight Torpedo development) and programmed improvements to the P-3C. Responding to the surface threat requires that we proceed with TOMAHAWK, HARPOON and PENGUIN anti-ship missiles for long, medium and short range application. We are continuing procurement of FFG-7 patrol frigates, the SSN-688 Attack Submarine, the LSD-41 Amphibious Landing Ship, and a rescue and salvage ship, the ARS. Mine warfare improvements will be provided by the MH-53E helicopter for minesweeping, the Intermediate Water Depth Mine, the Quickstrike family of shallow-water bottom mines, and the conversion of the MK 37 torpedo into a standoff sub-launched mobile mine.

Our mobility forces support rapid deployment of our forces overseas, provide flexibility to concentrate those forces once deployed, and provide for sustained logistics support to our own forces and our

allies. These forces will be enhanced through a variety of rotary and fixed-wing programs, as well as improvements to our sealift capability. Procurement of the CH-53E, the UH-60H and modernization of the CH-47 will significantly enhance the maintainability, reliability and survivability of our helicopter forces. Development of the new C-X "out size" airlift aircraft, procurement of the KC-10 general purpose tanker, modification of the C-5A wing, stretching the C-141 and emphasizing the very efficient CRAF modification program will lead to a greatly improved world-wide strategic airlift capability. The response of our amphibious forces will be improved by Maritime Prepositioning Ships (the T-AKX) with Marine equipment onboard. Sealift improvements are being made with procurement of multipurpose mobility ships, and in upgrading our capabilities for offshore bulk fuel transfer, underway replenishment and container offloading and transfer.

Theater and tactical C^3I programs are aimed at improving interoperability between the Services and among the general purpose forces of our allies, as well as supporting needed mobility features. We are proceeding with efforts to protect our systems from hostile counter-C^3 efforts, including jamming, disruption and exploitation of critical communication links. Improved mobility for theater command and control will be provided by development of a deployable modular Joint Crisis Management Capability (JCMC). Continued deployment of the E-3A and the E-2C HAWKEYE, and improvements in intelligence support to NATO will, in combination, enhance our theater surveillance and reconnaissance capabilities. Further improvements will be obtained from acquisition of

the TR-1, development of improved airborne radars, development of the Precision Location Strike System (PLSS), and the realistic evaluation of the BETA automated sensor information fusion center that will provide improved near-real-time location and identification of land targets and dissemination of targeting data. Improvements in theater and tactical data communications will result from the development of the Joint Tactical Information Distribution System (JTIDS). Communication systems with greater reliability and survivability will permit us to make better use of forces; specific programs include the Ground Mobile Force satellite Communications, Joint Tactical Communications (TRI-TAC) and the SINCGARS VHF Combat Net Radio. Special attention is being focused on upgrading our electronic warfare capabilities, including self-protection systems against Soviet air defense systems and command, control and communication jammers.

3. The Science and Technology Program

The DoD Science and Technology (S&T) Program is the key to maintaining our technological leadership. It includes Research, Exploratory Development and Advanced Technology Development. Our funding request for FY 1981 provides for real growth of more than six percent in this portion of our RD&A program.

Primary efforts are being focused on a set of high-leverage efforts such as:

- Research In New Frontiers Critical to DoD.

These include new materials, such as electroactive polymers and non-metallic conductors for electrical devices; fiber optics; high strength

titanium alloys and structural ceramic components and coatings. Microelectronics is another high leverage frontier in which we will be examining superconductive electronics for ultra-high speed processing and exploitation of on-chip integration for fast signal processing on a single chip.

o Energy R&E Program. The DoD Energy Program is directed to reduce the dependence of DoD activities on foreign oil imports through the future use of domestic synthetic fuels, improved designs to conserve energy and the use of other fuel and energy sources. We are developing new engines capable of using a broad range of fuels, and are accelerating the evaluation of several liquid hydrocarbon fuels (derived from low-quality petroleum crudes, oil shale, and coal) for use in military turbine engines.

o Adverse Weather Precision-Guided Munitions-Technology. The DoD precision-guided munitions (PGM) science and technology effort will capitalize on advances made in micro-electronics and signal processing. We will focus on improved all-weather capabilities, concentrating on sensor frequencies that can penetrate rain, haze, battlefield aerosols and dust.

o Very High Speed Integrated Circuits (VHSIC). The VHSIC Program is a five-year, major technology effort with a total funding of approximately $200 million. It is designed to expedite innovation in microelectronics areas essential to DoD's mission--areas in which DoD and commercial consumer needs have been diverging. The program is structured to accelerate the introduction of advanced integrated

circuit (IC) technology into military systems while addressing the associated problems of supply, interoperability, and software. New capabilities will allow important and significant advances in cruise missiles, satellites, avionics, radar, undersea surveillance, electronic warfare, communications and intelligence systems.

o <u>Advanced Composite Materials</u>. These materials show exceptional promise for improving the capabilities of our aircraft, missiles, and spacecraft, because of their outstanding structural and thermal efficiency. Most composites are made from raw materials available in the United States in large quantities, unlike some of the metals they will replace. Furthermore, their properties and fabrication methods permit simpler designs with lower manufacturing costs. We plan to continue full scale testing of carbon fiber reinforced plastic materials in operational aircraft, application of carbon fiber/carbon matrix materials to improve strategic missile reentry bodies and rocket nozzles, and advanced technology to examine a future generation of fiber-reinforced metals.

o <u>Manufacturing Technology</u>. This program will continue developing techniques to reduce the unit production cost of DoD weapon systems. Illustrative examples include programs in composite material fabrication, reducing metal removal costs through near net shape forging processes, advanced inspection methods, and improved technology for production control.

o <u>New Software Initiative</u>. In FY 1981 we will begin a major new initiative in computer software technology, developing

the techniques for writing the instructions which govern the data processing and decision-making capabilities of computer systems. Current DoD software expenditures have been estimated to exceed $5 billion annually and will grow as our use of computers increases. Consequently, the objective of this initiative is to achieve qualitative improvements in production software, and reduce software costs.

o <u>People-Related Research and Development</u>. The individual is DoD's most valuable resource. Even the most advanced weapons systems require personnel to operate them. We will maintain a strong program to improve our ability to select and train our people, to enhance the individual's physical and mental readiness for combat tasks, and to prevent and treat diseases and injuries that degrade combat performance. We also plan to increase our emphasis on training, focusing on those efforts that relate the characteristics of our weapon systems to future training requirements. Simulators and training devices will receive continued emphasis as a means of reducing fuel consumption while providing our forces with more effective training.

4. <u>Defense-Wide Support Programs</u>

Defense-wide C^3I programs are designed to enhance U.S. operations worldwide by developing systems that provide a tie between decision-making elements and operating elements in support of both strategic and general purpose forces. Improvements are being made to our intelligence capabilities in areas such as the Consolidated Cryptologic Program, the General Defense Intelligence Program, Indications and Warning Intelligence, and Tactical Intelligence And Related Activities.

Navigation and position-fixing capabilities will be substantially enhanced by continuing development of the NAVSTAR Global Positioning System and associated user equipment. Greater communications capacity, reliability and survivability will be provided by development of ground equipment and satellites for the Defense Satellite Communications System. Other communications efforts, such as the Secure Voice Improvement Program and the Digital European Backbone, will improve security from intercept, increase interoperability, and improve reliability and maintainability.

Other defense-wide support activities include test and evaluation and space orbital support. The test and evaluation program continues to emphasize the improvement of reliability and reduction of the vulnerability of our weapon systems. This major mission category includes those efforts which provide support to multiple defense missions and cannot be allocated directly to any other major mission area. Included are such activities as space launch and orbital support, global military environmental support, studies and analyses, and general management support.

The manned, reusable Space Shuttle, being developed under management of the National Aeronautics and Space Administration (NASA), will support all aspects of our national space program, including national defense requirements. To exploit fully its capabilities, we are developing an Inertial Upper Stage for use with the shuttle and are providing shuttle launch and landing facilities at Vandenberg Air Force Base.

TABLE I-1

RDT&E FUNDING BY MAJOR MISSION AREA
($ Millions)

	FY 80 (FY 80 $)	FY 80 (FY 81 $)	FY 81 (FY 81 $)	% Real Increase
S&T Program	2899	3135	3336	6.4
Defense Research (6.1)	558	603	652	8.1*
Exploratory Development (6.2)	1702	1842	2072	12.5*
Adv. Tech. Development (6.3A)	638	690	612	-11.3*
Strategic Warfare	2200	2379	3373	41.8
Strategic Offense	1500	1622	2480	52.9
Strategic Defense	466	504	559	10.9
Strategic Control	234	253	334	32.0
Tactical Warfare	5259	5688	5863	3.1
Land Warfare	945	1022	1069	4.6
Air Warfare	1289	1394	1069	-23.9
Naval Warfare	1461	1580	1714	8.5
Combat Support Includes Mobility, Logistics, Tactical C^3, CB Defense, Electronic Warfare, etc.	1564	1692	2011	18.9
Defense-Wide C^3I	1129	1221	1466	20.1
Defense-Wide Management & Support	2030	2196	2447	11.4
Technical Integration	112	121	140	14.8
Test & Evaluation Support	1026	1110	1204	8.5
Int'l Cooperative R&D	14	15	15	0
Management Support	500	541	588	8.7
Defense-Wide Mission Support Includes Space, Weather Support, etc.	378	409	500	22.3
TOTAL	13,517	14,619	16,485	12.8

* To make FY 1981 S&T percentages comparable with FY 80, it is necessary to consider $72M in high energy laser R&D which was, a result of modified ground rules, reoriented from 6.3A to 6.2, and $12M in nuclear monitoring which was reoriented from 6.1 to 6.2. The FY 81 real growth is then 10 percent for 6.1, 8 percent for 6.2 and -1 percent for 6.3A.

TABLE I-2

PROCUREMENT BY DEFENSE PROGRAM CATEGORY
($ Millions)

	FY 80 (FY [illegible] $)	FY 80 (FY 81 $)	FY 81 (FY 81 $)	% Real Change
Strategic Forces	4,[illegible]7	5,056	4,938	- 2.3
Aircraft	1,158	1,249	1,162	- 7.0
Missiles/Weapons	1,690	1,823	2,026	11.1
Shipbuilding	1,386	1,495	1,175	-21.4
Other	453	489	575	17.6
General Purpose Forces	24,207	26,110	27,626	5.8
Aircraft	10,597	11,430	11,368	- .5
Missiles/Weapons	5,125	5,506	7,223	31.2
Shipbuilding	5,293	5,709	4,941	-13.5
Other	3,212	3,465	4,094	18.2
Intelligence and Communications	3,273	3,530	3,709	5.1
Airlift/Sealift	376	406	728	79.3
Guard/Reserve Forces	1,527	1,647	1,366	-17.1
Central Supply/ Maintenance	1,000	1,079	1,118	10.1
Training, Medical, Other Personnel Activities	433	467	487	4.3
Administration and Associated Activities	45	49	103	110.2
Support to Other Nations	243	262	378	44.3
TOTAL	35,792	38,606	40,524	5.0

II

II. NET BALANCE - MILITARY EQUIPMENT AND TECHNOLOGY

A. INTRODUCTION

The complex calculus of deterrence includes many factors: the strength of our economic and industrial base; the solidarity of our allies; the morale of our military personnel and their leadership, training and doctrine; and the perception of U.S. resolve. But military equipment and the underlying technology are not only fundamental to the strength of our armed forces, they also provide the most visible component of deterrence.

In its quest for national power and prestige, the Soviet Union has always emphasized the acquisition of large quantities of military equipment. They have used the sheer size of this arsenal to achieve both military and political objectives.

We have come to accept a quantitative disadvantage in most categories of military equipment, relying on our clear qualitative superiority to provide an offset. More recently, the Soviet Union has focused its technological resources to close the qualitative gap in many categories of equipment--in fact to reverse it in a few selected categories. The result is a marked increase in unit costs, so that in many categories of Soviet military equipment the unit costs are comparable to those of counterpart U.S. equipment.

The CIA forecasts long term Soviet demographic problems that will probably limit future increases in the size of Soviet forces, and the rate of growth in operating costs during the early 1980's is expected

to be lower than it has been in the past. These indicators, in combination with R&D trends in the past decade, point to an increasing Soviet concentration on R&D, with future emphasis on more capable, more costly, and less manpower-intensive weapon systems which may be produced in somewhat smaller quantities.

In the near term, the level of Soviet military production will continue to permit both increases in the inventories of most weapons and the rapid modernization of Soviet forces in almost every mission area. The continuity and stability of this large and growing Soviet military investment program presents a growing challenge.

Last year I predicted that the near-term RD&A balance would continue to move toward the Soviet's favor. This near-term trend is likely to continue, considering that:

- The CIA estimates that Soviet defense spending will continue to increase in real terms, near the rate sustained for the last 15 years, at least through 1985. If economic pressures become particularly severe, the Soviets could moderate their defense program by stretching out selected weapon programs.
- Initiatives we have taken--both unilaterally and cooperatively with our allies--to redress previous adverse trends have not yet reached the point of significant payoff. Until they do so, the relative imbalance of military investments and production accumulated during the past decade will continue to generate advantages to the Soviet Union in deployed weapons and equipment.

The assessment which follows compares U.S. and Soviet military RD&A, considering defense investment, the acquisition process for major weapon systems, the balance of equipment--deployed, in production, and under development--and the status of underlying military technology.

B. DEFENSE INVESTMENT - OVERVIEW

The Soviet leadership continues to accord top priority to their military needs and has undertaken broadly based programs for research, development, and production of military systems. Total Soviet defense expenditures are large and growing, representing an estimated 11 to 14 percent of their gross national product since 1965.

Any common denominator used for comparing defense expenditures of the U.S. and the Soviet Union is imperfect, because of the considerable differences in our military and economic structures. An approach taken by the CIA is to compare the defense activities of the two countries using the common denominator of "dollar cost." Using this approach, the CIA estimates what it would cost in the United States to produce and sustain a military force with the same size and weapons inventory as that of the USSR. The estimates derived in dollar cost terms can then be compared with US defense outlays. This approach provides a general appreciation for the trends in the relative magnitude of the defense activities of the two countries in a way that reflects both the quality and quantity of military forces.

With the exception of RDT&E, the dollar costs of Soviet defense activities are developed on the basis of a detailed identification and listing of Soviet forces and their support. The components that make up these forces and their support are multiplied by estimates of what they would cost in the United States in dollars. The results are then aggregated by military mission and by resource category. The cost of

duplicating the Soviet's RDT&E effort in the United States is estimated in the aggregate by making an estimate in ruble costs, then converting that estimate to US dollars.

But evaluating the defense activities of both countries in dollar terms introduces a basic measurement problem common to all international economic comparisons, a problem known to economists as the index number problem. Because of this problem, a comparison will yield different results depending on which country's costs are used as the basis. Given different resource endowments and technologies, countrie tend to use more of the resources that are relatively cheap, and less of those that are relatively expensive. A comparison drawn in terms of the cost in one country may overstate the relative value of the activities of the other.

The degree of possible overstatement of Soviet defense activities relative to those of the United States inherent in the dollar cost comparison cannot be measured precisely. An appreciation of the magnitude of the index number problem can be obtained, however, by calculating the other extreme--that is, by computing the ratio of Soviet to US defense activities measured in <u>ruble cost</u> terms--thereby overstating US activities relative to Soviet. A ruble cost comparison shows Soviet defense activities in 1979 to be about 30 percent larger than comparable US activities; a dollar cost comparison shows them to be about 50 percent larger. Thus the potential effect of the overstatement is not large enough to alter the basic conclusion that Soviet defense activities in 1979 were considerably larger than those of the United States.

Measured in constant dollars, Soviet military investment (procurement, RDT&E, and military construction computed using estimated dollar costs) has grown at the fairly steady rate of four percent per year for the past 10 years (Fig II-1). Our military investment, now slightly higher than in 1975, declined in the first five years of the decade but now is also increasing by about four percent annually.

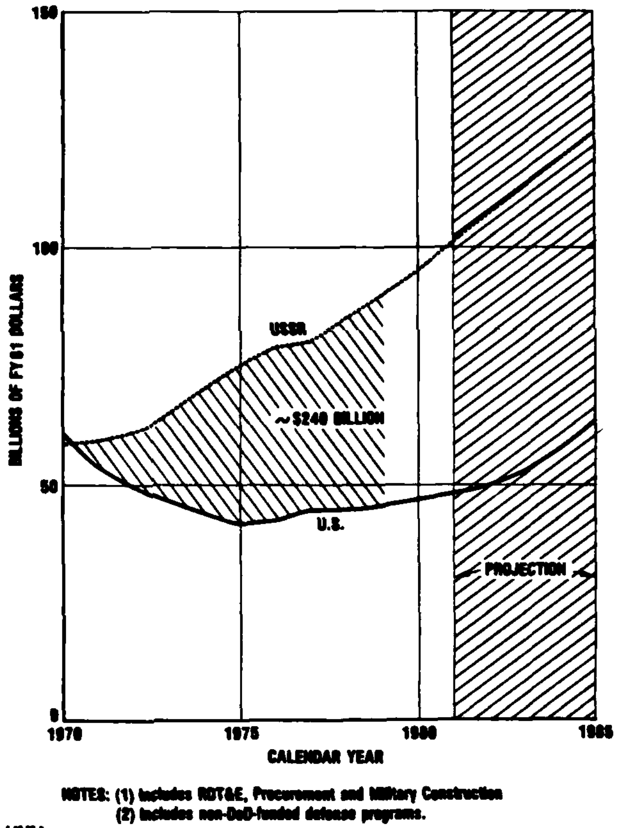

FIGURE II-1. Military Investment: A Comparison of U.S. Investment Costs With Estimated Dollar Costs of Soviet Investment

The estimated total annual dollar cost of Soviet military investment programs has exceeded that for U.S. defense programs since about 1970, and in 1979 exceeded the U.S. effort by about 85 percent. The cumulative disparity in investment since 1970 is approximately $240 billion in 1981 dollars.

Soviet investment continues to pay off in terms of improved R&D capabilities and weapon systems. Key developments that have been demonstrated in recent years include more accurate ICBMs, improved SLBMs and IRBMs, new interceptors and tactical aircraft, SAMs, lookdown/shoot-down radars, new electro-optical systems, high-speed submarines, new ships for open-ocean anti-submarine warfare (ASW) and open-ocean anti-ship missions, and improved electronic warfare capabilities.

We can, with confidence, project a sustained Soviet commitment to compete in quality with US weapon systems, attempting to do so without significantly decreasing their past emphasis on quantity. A clear indication of this commitment is the trend toward increasing the share of military outlays devoted to RDT&E (the RDT&E share of military outlays increased steadily over time from about 20 percent of total Soviet military expenditures during 1965-79, to almost 25 percent this year).

The output of military investment programs naturally involves a number of measures. One such measure is the number of major new weapons and modifications that are introduced each year. (See Fig II-2 for a comparable set of strategic and tactical weapons introduced each year.)

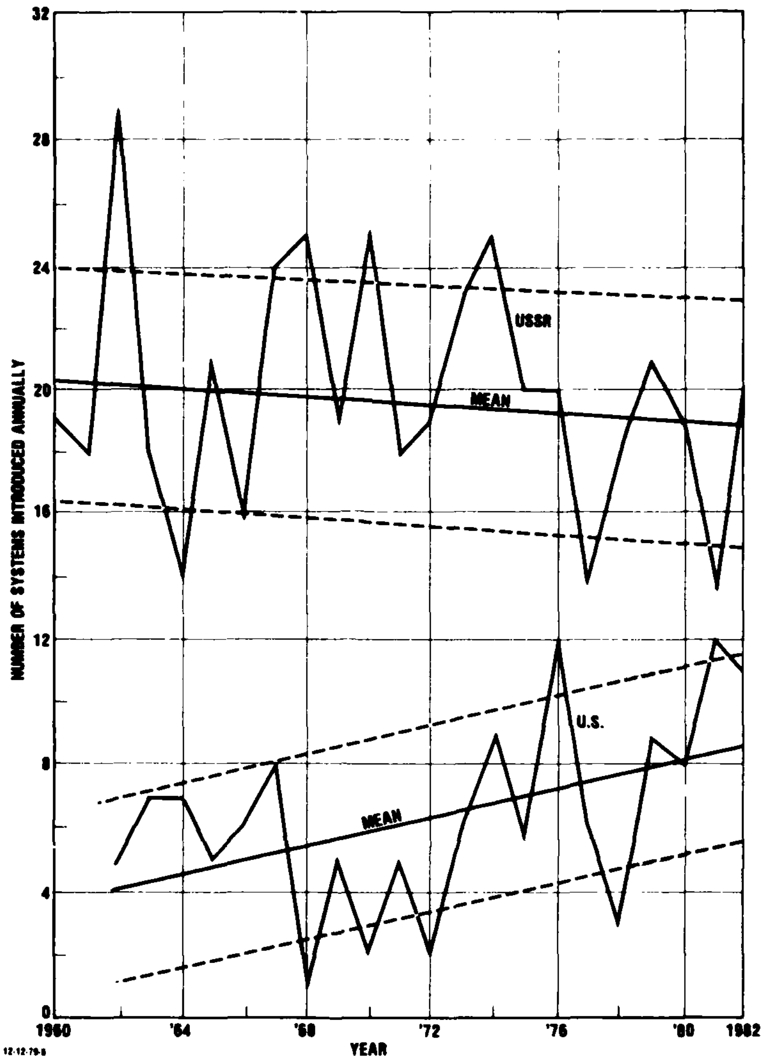

FIGURE II-2. A Comparison of Rates of Weapon System Introduction

C. THE WEAPONS ACQUISITION PROCESS

The main lines of Soviet policy and major resource allocations are established by the Politburo. The Defense Council, also chaired by Mr. Brezhnev, has responsibility for the Armed Forces and Defense policy. The more centralized, high level Soviet planning and control process tends to keep the Soviet military R&D system at a gradually increasing level of effort characterized by continuity and stability.

Key personnel, especially principal industrial ministers and chief designers, tend to have long tenure. Employment and the level of activity at the major Soviet RD&A installations remain relatively constant. Such stability facilitates long-range planning and the application of resources to meet long-range goals. Equally important is the evolutionary improvement in design teams as a result of long experience. The result is a regular progression of designs and prototypes (also evident in Fig II-2).

But there are also disadvantages associated with this built-in inertia. Once a decision is made about a program, it tends to be final. Thus, as the Soviets commit more and more resources to a given funded effort, it tends to gain momentum. If carried to an extreme, the result can be--and has been--inefficiency and waste, with weapon systems that fall far short of the original requirements. Examples of program termination are rare, but program termination occasionally does occur, even after an advanced stage of development; an example is the SS-16 ICBM.

Fulfilling established system requirements on time is emphasized in the Soviet military system. Trade-offs between technical performance and the timely completion of a project are usually made in favor of meeting the schedule. The constraint to use proven subsystems, parts, and components is a typical feature of Soviet weapons development.

The Soviet weapons development philosophy has in the past placed a high value on the production of large quantities of relatively simple, single-purpose systems which are reliable and fairly easy to maintain in combat. Long-term improvements in the performance of deployed weapons have typically been accomplished by progressive modification programs. Less frequently, innovative programs have also been supported, often at the instigation of high level policy intervention. These programs have included nuclear weapons, ICBMs, satellites, lasers, and a supersonic transport aircraft.

More recently, the distinction between the US and the Soviet development philosophy shows signs of fading. We are making more extensive use of progressive modernization and incremental improvement programs. Examples include modification of the CH-47D transport helicopter, A-6A to A-6E conversions, B-52 upgrades, M-60 tank upgrades and the development of modular pods to improve the effectiveness of our tactical aircraft. Many recent Soviet developments (e.g., the ALPHA submarine, a look-down/shoot-down radar, and the KIEV-class VTOL carriers) cannot be classified as the product of progressive modification programs. The new classes of Soviet heavy naval combat-

ants (e.g., MOSKVA-class aviation cruisers, VTOL carriers and nuclear cruisers) and tactical aircraft (e.g., FLOGGER and FENCER) can no longer be classified as either simple, or single purpose.

The Soviets have recently achieved major technological advancements in subsystem technology where the US has historically maintained a clear advantage; examples include radar signal processing, antennas and inertial platforms. The effectiveness of their acquisition system will, in large measure, be determined by the extent to which they can exploit this technology across the board in missiles, aircraft, ground and naval navigation, and fire control systems.

The largest share of Soviet RDT&E resources go to aerospace programs. There are numerous major Soviet organizations--integrating contractors--responsible for managing all missile and space development programs. Each of these organizations has a number of assigned specialties. Since about 1960, these organizations have demonstrated the capability to conduct roughly 50 missile and space programs simultaneously. During this period, the Soviets have developed well over 100 different missile systems of all kinds, and more than half of these have been new designs. Development in all major product lines is continuing.

The Soviet R&D process is not without significant weaknesses. Soviet development organizations have lower productivity than their U.S. counterparts. Soviet design institutions are hampered by their insularity and the environment of secrecy in which they are forced to operate. They strive for self-sufficiency to avoid dependence on

suppliers. In most cases, there is a bureaucratic separation between research institutes, design bureaus, and production facilities.

The strength of U.S. military R&D lies in the technical competence, productivity and innovative nature of American industry. Competition and relatively open debate throughout the entire U.S. acquisition cycle encourages identification and development of the best ideas and end products. The result is a tendency to innovate and press for optimum performance, sometimes at the expense of program cost and schedule.

In summary, the Soviet system has the advantages associated with institutional continuity--principally the ability to produce evolutionary systems in large numbers. But rigidity and procedural limitations greatly reduce efficiency and the incentives to innovate. The US system has the advantages that come with flexibility, openness, and competition; these include interaction between the commerical and defense sectors, technical excellence, and the exploitation of the new and revolutionary.

D. THE BALANCE OF MILITARY EQUIPMENT

1. Strategic Forces

Over the past decade, the estimated cumulative dollar costs of Soviet strategic force procurement were about two and one half times those of comparable U.S. outlays. Moreover, the gap widened over this period; the estimated Soviet procurement costs were almost twice those of the U.S. in 1970, but nearly three times higher in 1979. The trends are shown in Fig II-3.

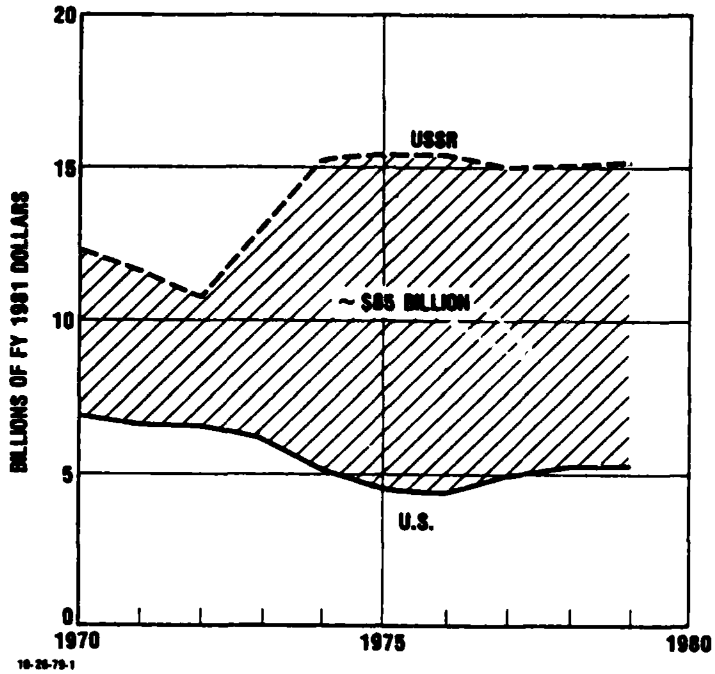

FIGURE II-3. Strategic Forces: A Comparison of U.S. Procurement Costs With Estimated Dollar Costs of Soviet Procurement

It is clear from this commitment of resources, and the huge quantity of strategic weapons which it is producing, that the Soviet Union hopes to achieve overwhelming superiority of strategic forces. The acceleration of U.S. strategic spending reflected in the Five Year Defense Program is intended to forestall that objective.

a. Strategic Offense. These forces consist of intercontinental ballistic missiles, submarine-launched ballistic missiles and the associated submarines, and intercontinental bombers.

(1) Deployed Equipment

U.S. and Soviet strategic systems deployed as of January 1, 1980 are shown in Table II-1.

TABLE II-1. DEPLOYED STRATEGIC SYSTEMS (1 JANUARY 1980)

SYSTEM	QUANTITY (Force Level)		QUALITY
	U.S.	USSR	
OFFENSE			
ICBM launchers[1,2]	1,054	1,398	Equal
SLBM launchers[1,3]	656	950	U.S. leads
Long-Range Bombers[4]	348	156	U.S. leads
DEFENSE[5]			
Surveillance Radars	88	7,000	USSR leads
Interceptors	327	2,500	U.S. leads
SAM launchers	0	10,000	USSR leads, none deployed in U.S.
ABM Defense Launchers	0	64	USSR leads, no U.S. system deployed

[1] Includes on-line missile launchers as well as those in construction, in overhaul, repair, conversion, and modernization.

[2] Does not include test and training launchers, but does include launchers at test sites that are thought to be part of the operational force.

[3] Includes launchers on all nuclear-powered submarines and, for the Soviets, operational launchers for modern SLBMs on G-class diesel submarines.

[4] Excludes 68 FB-111s and over 100 BACKFIRES. Includes deployed strike-configured aircraft only.

[5] Excludes radars and launchers at test sites or outside CONUS.

The dates of introduction of the U.S. and Soviet ICBMs are summarized in Table II-2. Soviet ICBMs include about 150 SS-17 launchers and more than 200 SS-19 launchers now deployed in converted SS-11 silos. And there are more than 200 SS-18 launchers deployed in converted SS-9 silos. These ICBMs can carry either single, high yield warheads or MIRVs. The SS-17 is equipped with up to four MIRVs, the SS-18 with up to ten, and the SS-19 with up to six. The

U.S. ICBM force includes 54 TITAN IIs and 450 MINUTEMAN IIs (each with one warhead) and 550 MIRVed MINUTEMAN IIIs (nominally three RVs per missile). To improve hard target capability, we are continuing deployment of the Mark-12A warhead on MINUTEMAN III ICBMs. This program will be completed in FY 1982.

TABLE II-2. DATES OF ICBM INTRODUCTION AND NUMBER OF LAUNCHERS

U.S.			USSR	
ICBM LAUNCHERS	IOC	1979 FORCE LEVEL	ICBM LAUNCHERS	IOC
Titan II	1961	54	SS-6	Early 60's
Minuteman I	1962	0	SS-7	Early 60's
Minuteman II	1966	450	SS-8	Early 60's
Minuteman III	1970	550	SS-9	Late 60's
			S-11	Late 60's
			SS-13	Early 70's
			SS-16	Mid-Late 70's
			SS-17	Mid-Late 70's
			SS-18	Mid-Late 70's
			SS-19	Mid-Late 70's
		1,054		

Our SLBM forces include 41 submarines carrying 656 SLBMs with a total of over 4,000 reentry vehicles. Ten of the submarines carry a total of 160 POLARIS A-3 missiles, each equipped with three MRVs. Thirty carry a total of 480 POSEIDON C-3 MIRVed missiles, each with up to 14 MIRVs. One POSEIDON submarine submarine has now been

backfitted with the TRIDENT I (C-4) missile which increases the full payload maximum range to more than 7000 KM.

The Soviet force includes 62 submarines carrying 950 modern SLBMs with a total of less than 2,000 reentry vehicles. The DELTA I submarines (each with 12 tubes) and the DELTA IIs (each with 16 tubes) are equipped with the SS-N-8, a single warhead missile with a range of about 8000 KM. A single active YANKEE-class submarine has been backfitted with twelve SS-N-17 missiles, providing greater accuracy and range than the SS-N-6 which it replaced. The remaining YANKEES each carry 16 SS-N-6 missiles. The SS-N-6 carries a single RV to about 3000 KM range. The Soviets have installed the MIRVed SS-N-18 missile in the 16 tubes of the DELTA III. The SS-N-6 carries a single RV to about 3000 KM range. The Soviets have installed the MIRVed SS-N-18 missile in the 16 tubes of the DELTA III. The SS-N-18 includes a single RV version and three and seven MIRV versions with ranges from 6500-7700 KM. Both the SS-N-8 and the SS-N-18 would permit the Soviets to hit targets in the U.S. from patrol areas in the Barents Sea.

The air-breathing leg of our strategic TRIAD includes B-52 long-range bombers and FB-111 medium bombers (each capable of delivering both gravity bombs and Short Range Attack Missiles), and KC-135 tankers. Presently deployed Soviet long-range bombers include the BEAR and BISON, both introduced in the mid-1950s. Over 50 BACKFIRES are now deployed with Soviet Long Range Air Forces, probably in support of peripheral attack missions. Both the BEAR and the BACKFIRE can carry one or two air-to-surface missiles.

TABLE II-3. DATES OF SLBM INTRODUCTION AND NUMBER OF LAUNCHERS

U.S.			USSR	
SLBM	IOC	1979 FORCE LEVEL	SLBM	IOC
Polaris A-1	1959	0	SS-N-4	Early 60's
			SS-N-5	Early 60's
A-2	1962	0	SS-N-6	Late 60's Early 70's
A-3	1964	160	SS-N-8	Early 70's
Poseidon C-3	1971	480	SS-NX-17	Late 70's
Trident C-4	1979	16	SS-N-18	Late 70's
		656		

Over the decade, the estimated cumulative dollar costs of procuring these Soviet strategic offensive forces exceeded comparable U.S. outlays by about 90 percent. In 1979, the estimated Soviet dollar procurement costs exceeded U.S. outlays by 100 percent. (See Figure II-4.)

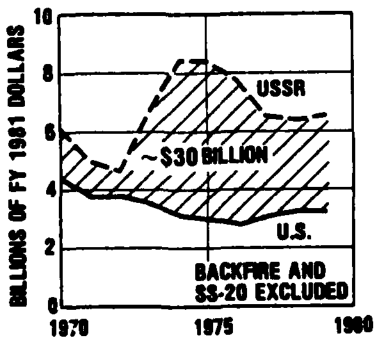

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FIGURE II-4. Strategic Intercontinental Forces: A Comparison of U.S. Procurement Costs With Estimated Dollar Costs of Soviet Procurement

The average age of U.S. and Soviet strategic offensive forces are compared in Figure II-5.

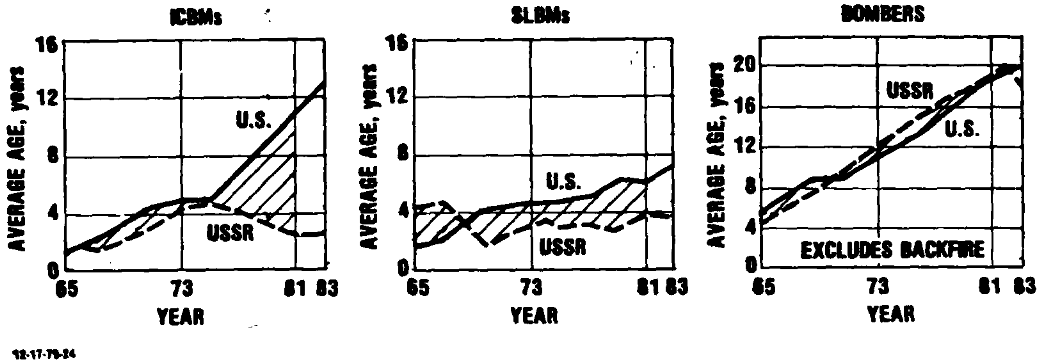


FIGURE II-5. Average Age of Strategic Intercontinental Forces

A comparison of the procurement costs for each of the ICBM, SLBM, and bomber forces is shown in Figure II-6. The estimated cumulative dollar costs of Soviet ICBM procurement for the 1970-79 period were nearly three times the corresponding U.S. outlays. For the SSBN/SLBM force, Soviet procurement costs were about 130 percent greater than the corresponding U.S. outlays, although by the decade's end, costs were approaching equality. For the intercontinental bombers (which includes related tanker systems and air-to-surface missiles), U.S. procurement outlays exceeded those of the Soviet Union for the decade of the seventies by over $8 billion.

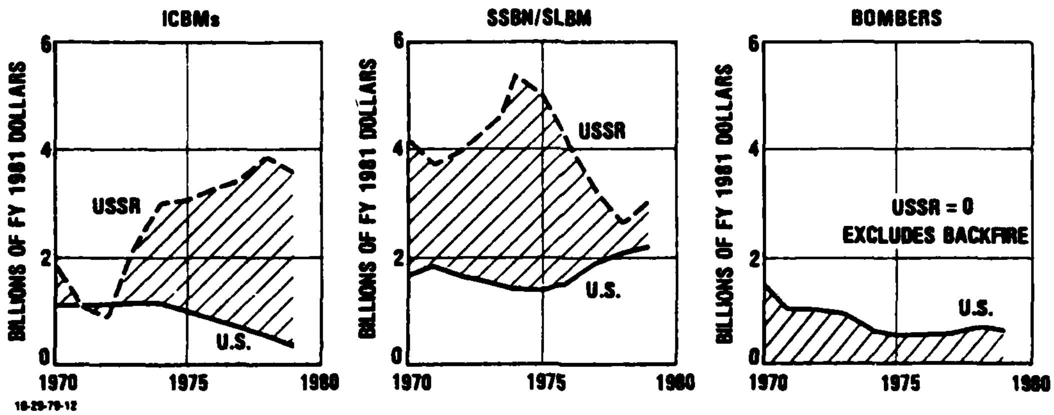


FIGURE II-6. Strategic Intercontinental Forces: A Comparison of U.S. Procurement Costs With Estimated Dollar Costs of Soviet Procurement

2. Production and Development

The Soviets have had a regular progression of new ICBMs. The new-technology, fourth generation Soviet ICBMs, each capable of carrying MIRVed payloads, are now well along in their deployment programs. Accuracy improvements being incorporated in the SS-18 and SS-19 will erode the accuracy advantage we had maintained in the MINUTEMAN force. The Soviets also are proceeding with development of their fifth generation ICBM systems. We estimate that there are at least four missiles under development (some of these may be modifications of existing systems).

U.S. production of SLBMs ceased after 1975 but was resumed last year when the fitting out of 12 POSEIDON submarines with the longer-range Trident I missile began. Trident submarines, each with 24 missiles, will be coming into service in FY 1981.

The Soviets continue to expand and modernize their SLBM force. They are developing the new TYPHOON SLBM. In the last six years, the USSR has produced over 20 SSBNs; the U.S. has launched one TRIDENT SSBN which is not yet operationally deployed.

The aging Soviet BEAR and BISON fleets are expected to be replaced by a new heavy bomber or a transport carrying short range air-to-surface missiles, new long-range cruise missiles or both. The Backfire bomber is being deployed with Long Range Aviation and Soviet Naval Aviation units at the rate of 30 per year.

Our ALCM program will provide the most significant improvement to our strategic bomber force, with an IOC planned by December 1982. The ALCM will sustain the capability to penetrate Soviet air defenses, with the accuracy necessary to place even the hardest targets at risk. These weapons will ultimately be loaded both externally and internally on our B-52G bombers, roughly doubling the number of weapons carried by these aircraft.

b. Strategic Defense. The Soviets continue to emphasize strategic defensive weapons and forces, whereas the U.S. has essentially eliminated its Strategic Air Defense. Annual procurement costs are shown in Figure II-7. Over the past decade, estimated dollar costs to procure Soviet forces have been about eight times those for comparable U.S. forces. In 1979, the estimated Soviet dollar cost for interceptor and SAM procurement was about $3 billion.

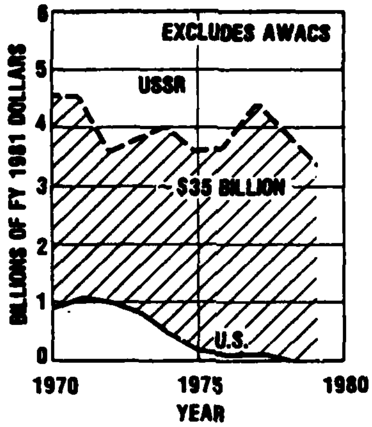


FIGURE II-7. Strategic Defense: A Comparison of U.S. Procurement Costs With Estimated Dollar Costs of Soviet Procurement

(1) Surveillance and Warning. The Soviets are developing and deploying over-the-horizon radars and new large phased-array radars. These programs will increase warning time and improve the ability of the USSR to determine the size, nature, and objectives of a ballistic missile attack. U.S. early warning satellites, BMEWS, PARCS, Pave Paws, and FPS-85 radars already perform these same functions.

While we have some 60 air defense surveillance radars deployed in the U.S., the Soviets have over 7,000. Our air defense warning has derived from the Distant Early Warning and Pinetree Lines installed in the 1950s. We expect improved capabilities as we employ AWACS for surveillance and tracking in North America; the Soviets are only now developing an AWACS.

(2) Interceptors. The Soviets have deployed two new interceptor aircraft since 1970. We believe they are currently

developing new interceptor aircraft. Their development of a look-down/shoot-down capability and a new air-to-air missile for the modified Foxbat is a major step toward improving their low-altitude defenses against bombers and fighters. As the Soviets deploy this system, they will deny us the significant advantage of avoiding airborne intercept by flying at low altitude. Our dedicated continental air defenses include F-106s augmented by TAC F-15 and F-4 aircraft. Of these, the F-15 is equipped with a look-down/shoot-down capability.

(3) SAMs. Unlike the U.S., which eliminated its 135 continental strategic defense SAM batteries by 1975 (because of the minimal bomber threat relative to other Soviet strategic forces), the Soviets have continued to deploy SAMs. In the last decade, they reduced the size of the SA-2 strategic SAM force, but continued to deploy the newer SA-3 and SA-5 SAMs, resulting in some 10,000 SAMs. The Soviet SA-X-10 missile, now under development, is expected to be operational this year.

(4) Ballistic Missile Defense (BMD). The U.S. has deactivated its one ABM facility while the Soviets continue to maintain the Moscow ABM defense complex (64 launchers). Both the U.S. and the USSR maintain active R&D programs in support of BMD. The Soviet effort includes a program of performance improvements for their large phased array detection and tracking radars, with development of a rapidly deployable ABM system which includes a new interceptor. The U.S. is improving the reliability and capability of the Ballistic Missile Early Warning System (BMEWS). The U.S. BMD R&D program includes a broad-based

advanced technology program to maintain our technology lead over the Soviet Union, and a systems technology program to hedge against future capabilities and uncertainties.

(5) Space Warfare. The Soviets currently have developed and tested an anti-satellite (ASAT) system which could attack our satellites. They are also conducting R&D on advanced technologies.

The U.S., however, does not currently have an ASAT system, and an asymmetry exists in that we cannot counter the Soviet satellites that represent a threat to our military forces. While we hope that negotiations on ASAT limitations lead to strong, symmetric controls, we have placed emphasis on our research and development activities to increase our satellite survivability against attacks, should they occur, and to be able to destroy Soviet satellites if necessary.

The primary U.S. ASAT effort is the development of a high technology interceptor utilizing a miniature vehicle. The design has the advantage of being light weight, allowing it to be launched from an F-15 aircraft for low-altitude intercepts.

3. Theater Nuclear Forces

The main purpose of the theater nuclear forces is the deterrence of attack by means of: 1) forward defenses, greatly strengthened with the short-range firepower of nuclear weapons; and 2) longer-range systems applied against interdiction and troop targets, enemy nuclear systems, and strategic targets deep in the homeland of the enemy. Because the Warsaw Pact and NATO have concentrated so many of their respective capabilities in Central Europe, our comparison of

theater nuclear forces has tended to focus on Europe. We have already deployed on the order of 7,000 nuclear weapons to the European theater in support of NATO--the great majority of the weapons being associated with short-range delivery systems.

The PERSHING missile is the only U.S. delivery system currently dedicated solely to the tactical delivery of nuclear weapons. For the rest, we rely on dual-purpose artillery, missiles such as LANCE and HONEST JOHN, aircraft with limited combat radii, surface ships, and SAMs--systems with a non-nuclear capability and a primary mission of non-nuclear warfare--to deliver our theater-designated weapons.

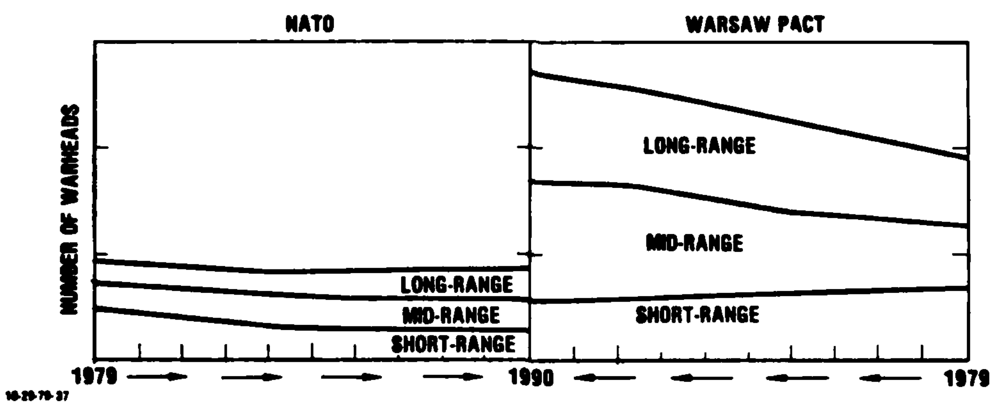
The Soviets, by now, have deployed large numbers of theater-oriented nuclear delivery systems and we believe they have stockpiled sufficient warheads to supply these systems. They rely on dual-capable systems for much of their theater nuclear delivery capability. We believe that some of their 203 mm and 240 mm artillery pieces, now deployed in the USSR, have been adapted to fire nuclear projectiles. Their more modern fighter aircraft--the Su 17 (FITTER C/D), Su-24 (FENCER), and some versions of the FLOGGER (MiG-23 and 27)--are probably dual-capable as well. However, the Soviets continue to emphasize nuclear delivery systems organic to their general purpose forces. They consist of the FROG series, the SCUD B, the SS-12 SCALEBOARD, and two follow-on missiles--the SS-21 for the FROG launchers and the SS-22 for the SCALE-BOARD LAUNCHERS.

The SS-20 and BACKFIRE are gradually replacing older missiles and bombers. The SS-20 is a substantially more capable missile than

its predecessors; not only is it mobile and difficult to target, but it includes three warheads, its range is greater, and we estimate that its accuracy has been substantially improved. The BACKFIRE, similarly, is considered to be more capable than the BADGER and BLINDER.

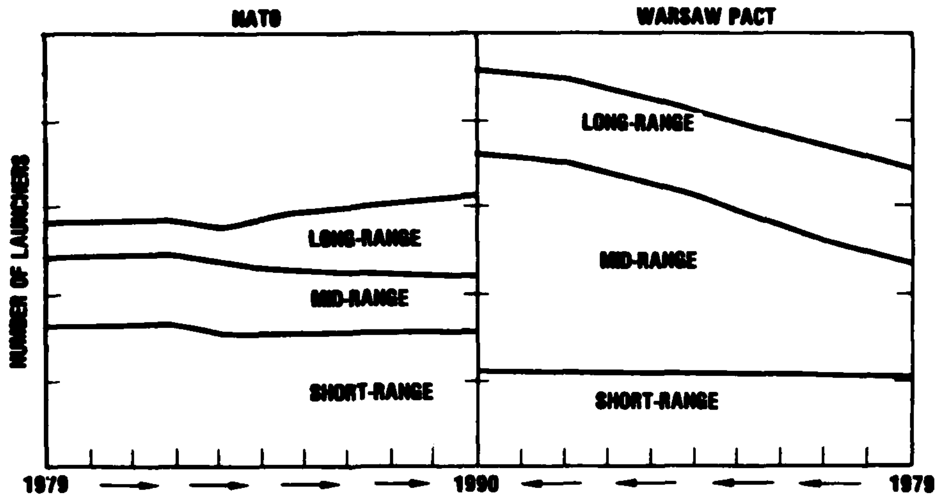
We are continuing to modernize and protect those parts of our tactical nuclear capability that are designed principally for battlefield use and shallow interdiction targets. We are also proceeding with the development of the longer range, more mobile, and more accurate PERSHING II ballistic missiles, and with the Ground-Launched Cruise Missile (GLCM), which is also long-range, mobile, and accurate. We are now developing plans in conjunction with our allies for the deployment of these missiles in Great Britain and on the European continent.

Expected trends in offensive Theater Nuclear Forces (TNF) warheads and launchers are shown in Figure II-8 and II-9.



NOTE: Includes operational warheads on all missiles, including reloads. Includes warheads deliverable by all nuclear-capable aircraft in first sortie (excludes reloads). Also excludes ADM, Nike Hercules, ASW, AAW, ASUW warheads.

FIGURE II-8. Trends in Theater Nuclear Forces Warhead Balance



NOTE: Includes only missiles on launchers. Includes counting each aircraft as a single launcher. Soviet artillery includes nuclear-dedicated tubes. U.S. artillery limited to number of warheads deployed.

FIGURE II-9. Trends in Theater Nuclear Forces Launcher Balance

4. General-Purpose Forces

The estimated annual dollar cost for procuring Soviet general-purpose force equipment increased by 40 percent over the decade of the seventies. Corresponding U.S. outlays fell almost 50 percent, but all of this decrease took place before 1976. Since then, U.S. procurement outlays have grown slowly, as seen in Figure II-10. Over the period, cumulative Soviet procurement exceeded that of the U.S. by approximately $80 billion.

Soviet general-purpose forces increased as a result of: (1) the expansion and modernization of ground and tactical air forces, (2) the buildup along the Sino-Soviet border and in

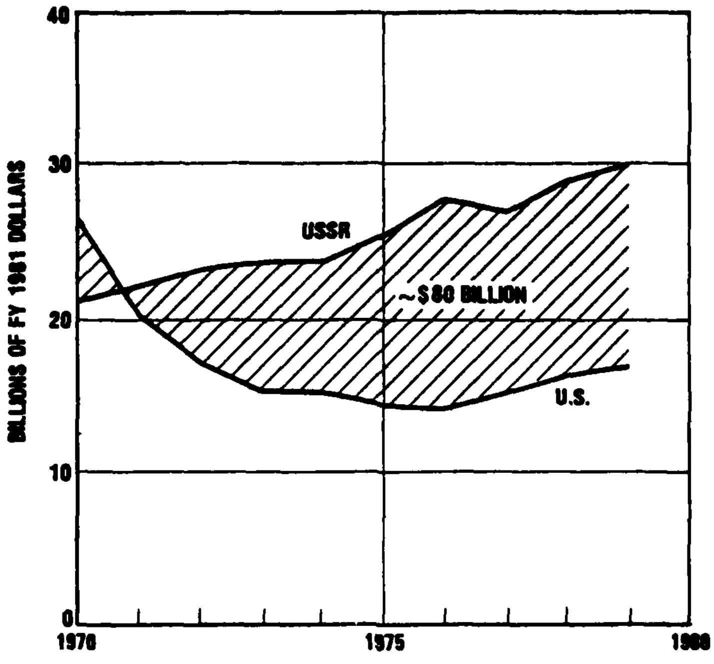


FIGURE II-10. General-Purpose Forces: A Comparison of U.S. Procurement Costs With Estimated Dollar Costs of Soviet Procurement

Warsaw Pact areas, and (3) the increase in Soviet naval force levels and operations.

a. Land Forces. Since 1970, cumulative dollar estimates of Soviet procurement costs for land force equipment were over three times those for U.S. forces. Although annual Soviet procurement expenditures were only 35 percent higher at the beginning of the period, they are over three times as great now (see Figure II-11).

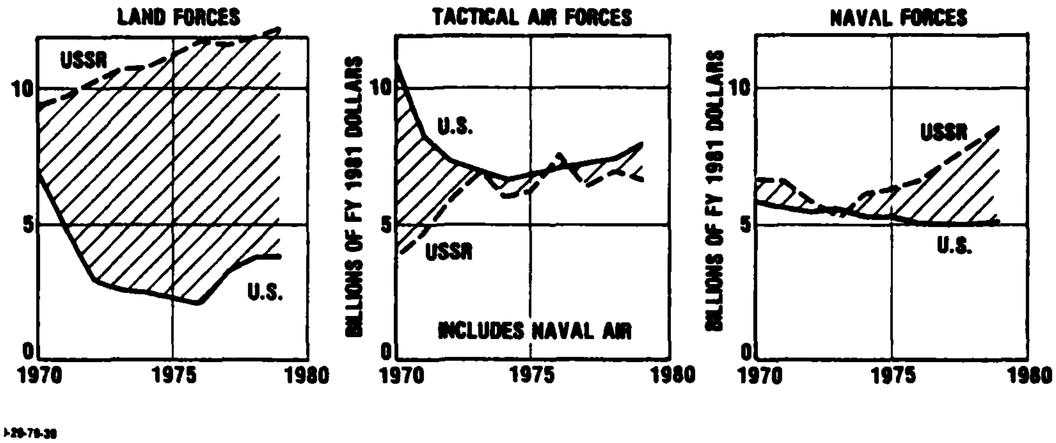


FIGURE II-11. Elements of General-Purpose Forces: A Comparison of U.S. Procurement Costs With Estimated Dollar Costs of Soviet Procurement

Deployed equipment in support of NATO and Warsaw Pact land forces is compared in Table II-4. The Warsaw Pact maintains substantially large numbers of most deployed equipments.

TABLE II-4. DEPLOYED LAND FORCE SYSTEMS (1 JANUARY 1980)

WEAPON	QUANTITY Ratio of NATO:WP	QUALITY
Tanks	1:2	USSR T-72 superior to U.S. M60A3
Artillery and Rocket Launchers	1:2	NATO lead declining. NATO leads in lethality
Armored Fighting Vehicles	1:2	Warsaw Pact leads
Anti-Tank Missile Launchers	2:1	Equal, but Pact improving
SAMs (not man portable)	1:7	Equal: Pact leads in mobility. NATO leads in lethality and envelope
Military Helicopters	1:1	NATO lead declining

The manpower and weapons inventory of Soviet land forces continues to expand. The size of Soviet divisions has increased, and by adding over 10 divisions they have increased the total number to over 170.

The Soviet Union has continued to support chemical warfare capabilities; Warsaw Pact forces are equipped for and routinely practice in chemical warfare.

Comparative NATO-Warsaw Pact production is summarized in Table II-5.

TABLE II-5. PRODUCTION SUMMARY[1] OF SELECTED TACTICAL WEAPONS FOR NATO[2] AND WP COUNTRIES

WEAPON	1974-1979 Average Production Ratio	
	USSR:U.S.	WP:NATO
Tanks	2.5:1	2:1
Other Armored Vehicles[3]	9:1	3:1
Artillery (over 100mm)	10:1	16:1
Tactical Combat Aircraft[4]	2:1	1:1
Military Helicopters	3:1	1:1
SAMs (not man-portable)[5]	18:1	7:1
Major Naval Surface Combatants (over 1000 tons)	2:1	1:1.5
Attack Submarines	2:1	1:1

[1]Rounded to two significant figures.

[2]Includes France.

[3]Includes light tanks, personnel carriers, infantry combat vehicles, reconnaissance vehicles, and fire-support and air-defense vehicles.

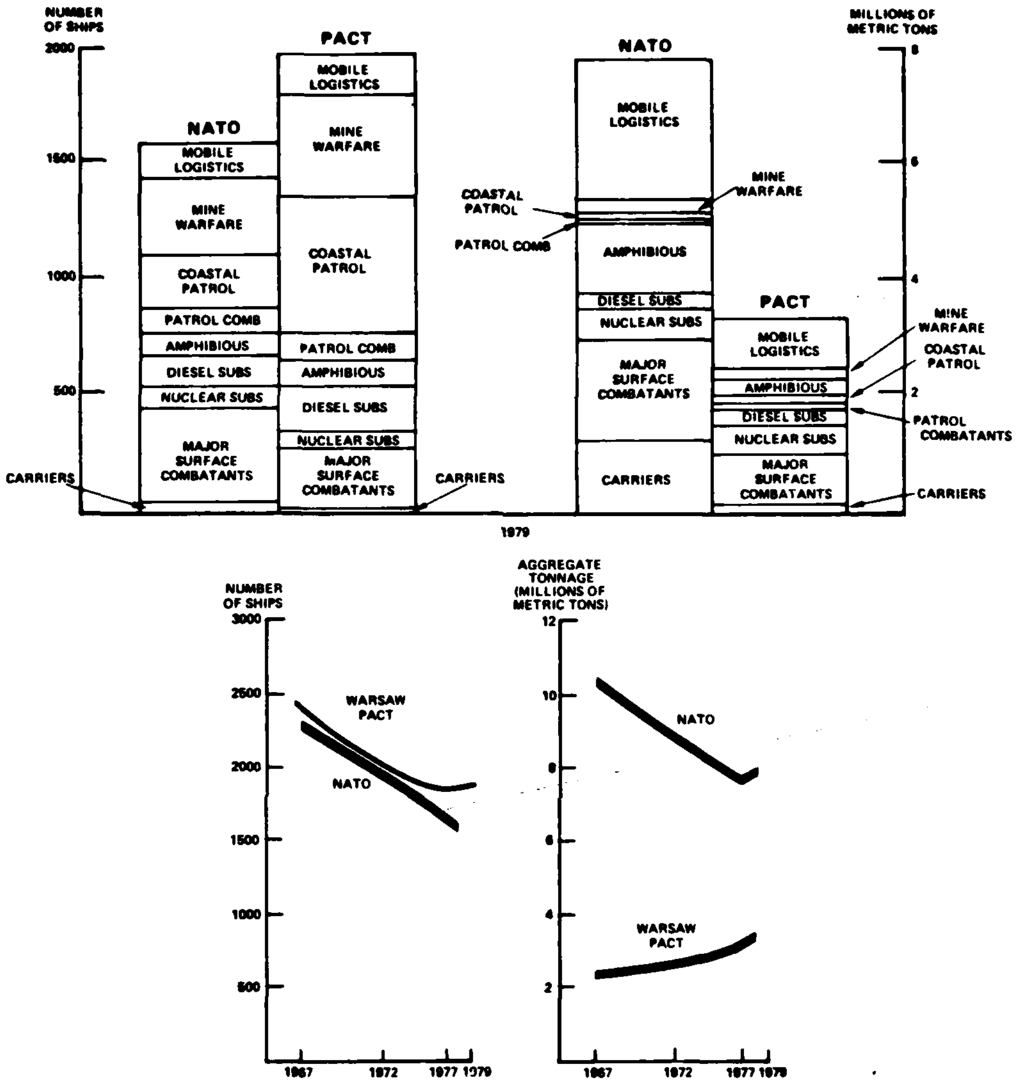
[4]Includes tactical fighter, attack, reconnaissance, electronic warfare and all combat-capable tactical training aircraft.

[5]USSR and WP figures include SAMs for other countries.

b. Tactical Air Forces. In the 1970-1979 period, the estimated cost for Soviet procurement of tactical air forces (including naval aviation) was roughly $15 billion less than for corresponding U.S. procurement. The current funding estimate for Soviet procurement is slightly lower than the corresponding U.S. outlay. Tactical combat aircraft produced for the USSR forces include the late model FLOGGER, FITTER, FENCER, FISHBED, and FOXBAT--with additional aircraft produced for WP allies. The annual production for U.S. forces has averaged about 300, with an additional 250 produced for our NATO allies. In the last six years, over half of U.S. production consisted of A-7s, F-14s, and F-15s. NATO is producing a dozen different types of tactical aircraft.

Comparing the level of technology embodied in deployed equipment, the U.S. is superior in almost all respects. It is superior, in particular, in avionics, fighter/attack aircraft, air-to-air missiles, precision-guided munitions, and airlift.

c. Naval Forces. While comparisons are usually made between the Soviet and U.S. general purpose naval forces, neither would be likely to engage the other without the involvement of its allies. Accordingly, trends in the number of ships, and in the tonnages, of the NATO and Warsaw Pact navies (with ballistic missile submarines and their supporting vessels excluded) are shown in Figure II-12.



NOTES

1. MOBILE LOGISTIC SHIPS INCLUDE ONLY THOSE AUXILIARIES WHICH PROVIDE UNDERWAY REPLENISHMENT OR DIRECT MATERIAL SUPPORT TO UNITS OPERATING AWAY FROM HOME BASE. A NUMBER OF OTHER AUXILIARY TYPES ARE NOT INCLUDED IN THESE TOTALS

2. DISPLACEMENTS SHOWN ARE FULL LOAD FOR SURFACE SHIPS AND SUBMERGED FOR SUBMARINES

FIGURE II-12. GENERAL PURPOSE NAVAL FORCES OF NATO AND THE WARSAW PACT

During the past decade, estimated dollar costs of Soviet general-purpose naval force procurement have been about $15 billion more than corresponding U.S. outlays, if U.S. multipurpose aircraft carriers are excluded. However, U.S. procurement costs exceeded Soviet procurement costs by about $20 billion, if U.S. carriers and their aircraft are included.

The Soviets have increased their strong capabilities against aircraft carriers operating within range of Soviet naval strike aircraft. In the past decade, two classes of large air-capable ships--one a guided missile VTOL aircraft carrier, the other a guided missile cruiser--have been introduced. These are multipurpose ships which have capabilities for anti-ship operations. New-design cruiser classes, one nuclear-powered, are under construction and are expected to be outfitted with advanced varieties of new weapon systems. A new aircraft carrier program could involve ships of the 60,000 ton class.

A key deficiency of Soviet naval forces is their limited ASW capability. The performance of their ASW forces is improving slowly and remains substantially below comparable U.S. forces.

U.S. naval construction has stressed the building of major combatants--cruisers, destroyers, and frigates. While many of the new Soviet ships were minor combatants, there has been an increase in the number of large combatants under construction. The total tonnage of new Soviet ships was 90 percent of the comparable U.S. new tonnage in the 1970-1979 period.

Table II-5 summarized relative annual production of key weapons solely for use by the general-purpose forces of both NATO and Warsaw Pact countries. In many cases, however, additional weapons were produced by NATO and Warsaw Pact countries for delivery to other countries. Figure II-13 illustrates the ratios of total weapons production by NATO and the Warsaw Pact. NATO produced slightly more tactical combat aircraft, military helicopters, attack submarines, and major surface combatants. However, when Pact production exceeded that of NATO, it was by a substantial margin.

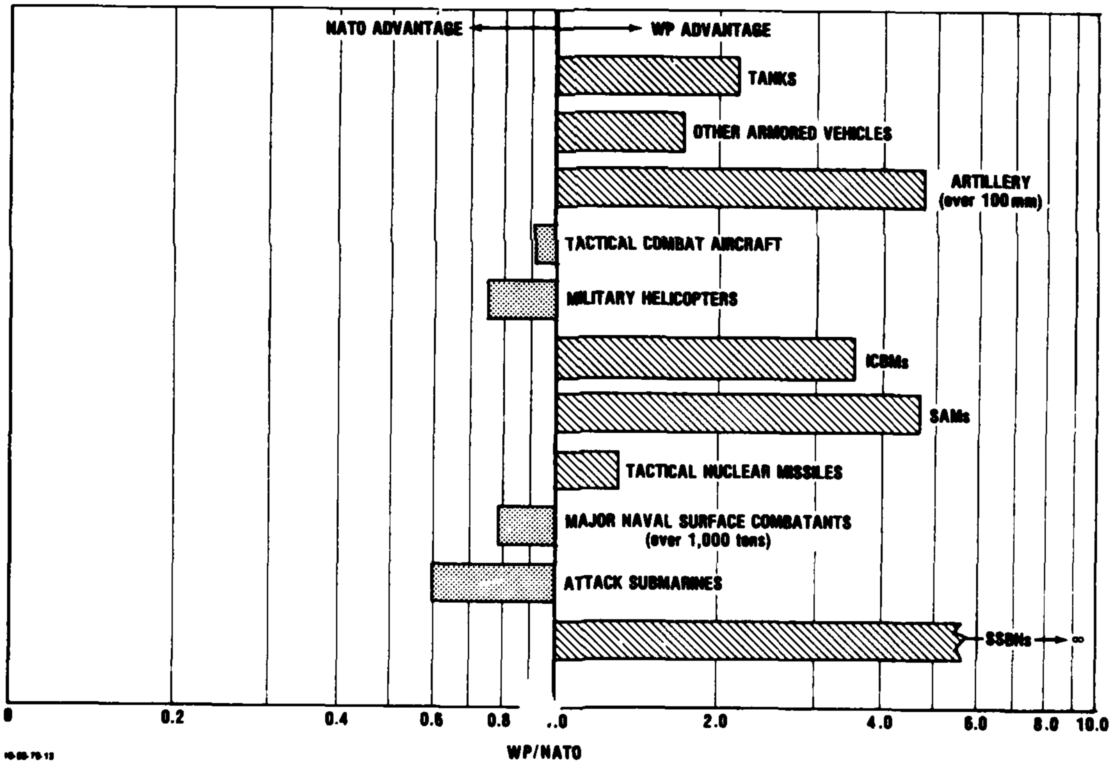


FIGURE II-13. Ratio of 1974-1979 Average Annual Production of Selected Weapons by WP and NATO Countries

E. A COMPARISON OF BASIC MILITARY TECHNOLOGIES

As I reported last year, our technology is still superior to that of the Soviets in most areas. But the stable growth in Soviet R&D investment and the continuity of their design teams have led to the erosion of our preeminence. The Soviets have established and maintain a vast base of facilities for designing, developing, and testing military systems.

To support the Soviet Union's expanding military strength and economy, the Soviet leadership continues to attach great importance to the development of professional manpower. We estimate that the total number of "scientific workers"--a category often used to compare U.S. and Soviet R&D employment--has increased to over 1,000,000. Over half of this total is engaged in military R&D. But, for a variety of reasons, the productivity of Soviet scientific workers is very much less than our own. The number of comparable scientific workers engaged in U.S. military R&D is less than 300,000.

The Soviets acknowledge that our overall lead in science and technology is a great competitive asset and they are determined to eliminate it. Toward that end, we estimate that they have steadily increased the share of their defense expenditures (measured in rubles) devoted to RDT&E, reaching about 25 percent in 1979, up from 20 percent about 10 years ago. By way of comparison, about 10 percent of U.S. defense expenditures are earmarked for RDT&E.

There is considerable uncertainty surrounding estimates of the dollar costs of Soviet military RDT&E. Nevertheless, the available

information on particular RDT&E projects, published Soviet statistics on science, and statements by Soviet authorities on the financing of research, indicate that military RDT&E expenditures were both large and growing during the 1970-79 decade.

For the 1970s as a whole, the estimated cumulative dollar costs of Soviet military RDT&E activities were roughly 50 percent greater than U.S. outlays for comparable activities. In 1979, they were almost twice as much as corresponding U.S. outlays; over the decade they have invested roughly $70 billion more in RDT&E than the U.S. The comparison over the decade of the seventies is shown in Figure II-14.

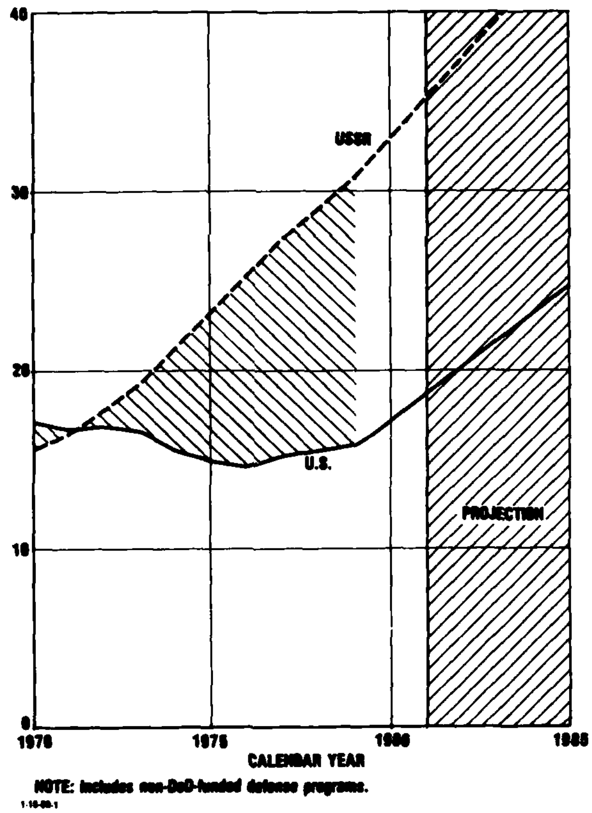


FIGURE II-14. Military RDT&E Programs: A Comparison of U.S. RDT&E Costs With Estimated Dollar Costs of Soviet RDT&E

Despite this imbalance in RDT&E outlays, we have maintained technological leadership in most critical areas. But our technical advantage in deployed equipment is eroding, especially in weapons for the ground forces, where the bulk of our deployed equipment was built in the 60s and the bulk of the Soviet deployed equipment was built in the 70s.

Table II-6 compares the status of some important basic technologies. This list, like that developed last year, does not show the fragile nature of technology (e.g., the rate of technological progress over time or the military effectiveness of a particular deployed technology over time). I note that the U.S. lead in most of the technologies has been narrowed in the past few years. As Soviet R&D investments and technological competence continue to increase, they will provide growing opportunities for future technological surprise.

Table II-7 compares the technology level reflected in deployed weapon systems. One of the most significant observations from this assessment is that while the Soviets lead in none of the basic technologies in Table II-6, they do lead in the technology level of many of the deployed weapon systems listed previously. This underscores the need to improve our exploitation of basic U.S. technology as we translate it into deployed military capability.

TABLE II-6. RELATIVE U.S./USSR STANDING IN THE 20 MOST IMPORTANT BASIC TECHNOLOGY AREAS

BASIC TECHNOLOGIES	U.S. SUPERIOR	U.S.-USSR EQUAL	USSR SUPERIOR
1. Aerodynamics/Fluid Dynamics		X	
2. Automated Control	X		
3. Computer	←X		
4. Military Instrumentation	X		
5. Directed Energy		X	
6. Electrooptical Sensor (including IR)	X		
7. Guidance and Navigation	X→		
8. Hydro-acoustic	X		
9. Intelligence Sensor	X		
10. Manufacturing	X		
11. Materials (Lt Wt & High Strength)	X→		
12. Microelectronic Materials and Integrated Circuit Manufacture	←X		
13. Non-Acoustic Submarine Detection		X	
14. Nuclear Warhead		X	
15. Optics	X→		
16. Propulsion (Aerospace)	X→		
17. Radar Sensor		X	
18. Signal Processing	X		
19. Software	X		
20. Telecommunications	X		

1. The list in aggregate was selected with the objective of providing a valid base for comparing *overall* U.S. and USSR *basic* technology. The technologies were specifically not chosen to compare technology level in currently deployed military systems. The list is in alphabetical order.

2. The technologies selected have the potential for significantly changing the military balance in the next 10 to 20 years. The technologies are not static; they are improving or have the potential for significant improvements.

3. The arrows denote that the relative technology level is changing significantly in the direction indicated.

4. The judgments represent averages within each basic technology area.

TABLE II-7. RELATIVE U.S./USSR TECHNOLOGY LEVEL IN DEPLOYED MILITARY SYSTEMS*

DEPLOYED SYSTEM	U.S. SUPERIOR	U.S.-USSR EQUAL	USSR SUPERIOR
STRATEGIC			
ICBM		X	
SSBN/SLBM	X→		
Bomber	X		
SAMs			X
Ballistic Missile Defense			X
Anti-satellite			X
TACTICAL			
Land Forces			
SAMs (including Naval)		X	
Tanks			←X**
Artillery	X→		
Infantry Combat Vehicles			X
Anti-tank Guided Missiles		X	
Attack Helicopters	X→		
Chemical Warfare			X
Theater Ballistic Missiles		X	
Air Forces			
Fighter/Attack Aircraft	X		
Air-to-Air Missiles	X		
PGM	X		
Air Lift	X		
Naval Forces			
SSNs		X	
Anti-Submarine Warfare	X→		
Sea-based Air	X→		
Surface Combatants		X	
Cruise Missile		X	
Mine Warfare			X
Amphibious Assault	X→		
C^3I			
Communications	X→		
Command and Control		X	
Electronic Countermeasure		X	
Surveillance and Reconnaissance	X→		
Early Warning	X→		

*These are comparisons of system technology level only, and are not necessarily a measure of effectiveness. The comparisons are not dependent on scenario, tactics, quantity, training, or other operational factors. Systems farther than 1 year from IOC are not considered.

**The arrows denote that the relative technology level is changing significantly in the direction indicated.

III

III. ACQUISITION MANAGEMENT

In fiscal year 1979 the Department of Defense enacted over 12 million contractual actions. These actions represent close to 70 billion dollars or approximately three quarters of the total acquisition funds spent by the Federal Government.

One of the keys to maintaining a favorable net balance in military equipment and technology vis a vis the Soviets is to use our acquisition management process to exploit the inherent strength of our free enterprise system. To do so, we must better apply our advantages in rapid technological advancement, production efficiency and general inventiveness. With this goal in mind, we are pursuing a number of initiatives while maintaining the major thrusts of: (1) increasing the use of competition, starting with the conceptual phase and extending its application through engineering development and into production, (2) introducing the concept of affordability into the acquisition process in order to align our on-going and projected system needs with anticipated fiscal resources, and (3) planning and initiating new programs in a mission area context, within the framework of sound acquisition policy.

A. USE OF COMPETITION

The Department is taking a variety of management actions designed to improve the acquisition of supplies and services

by competitive means. In FY1979, an additional $2 billion was awarded price competitively compared to FY1978, thereby, reversing the decline in competition that had been experienced during the 1970's. This reversal increased the price competitive rate from 25.7 percent in FY1978 to 27.3 percent in FY1979; the first significant upturn in the past 10 years. The main driver increasing the competition percentage in FY1979 over FY1978 was ships, more than offsetting the continuing decline in competitive procurements of petroleum.

If we compare DoD's overall competitive results, i.e., price competition, technical competition, and follow-on awards (where the source was initially obtained through price or technical competition) between FY1978 and FY1979, there is an increase from 53.1 percent to 54.2 percent.

There are many factors that affect competition. The type of item, the quantity, the market condition, and our acquisition strategy are some of the factors directly affecting competitive statistics. Past source selection decisions determine the sources for annual production buys of many of our major systems. Our decisions on new systems today will be reflected in future DoD statistics. We are trying to shape those decisions in a manner to increase competition in the years ahead. Techniques to do this are discussed below.

We are developing general criteria for evaluating programs to determine which ones have the potential to provide a return substantial enough to offset the initial investment the Department will have to make in order to obtain a competitive source(s). We will require a cost-benefit analysis to ensure that alternate production sources are considered on all DSARC programs prior to moving into the demonstration/validation phase. Planning for production competition must start early in the acquisition process to be effective. We are in the process of changing the Defense Acquisition Regulation to encourage earlier development of competitive sources through such mechanisms as co-development teaming, leader-follower contracting, and direct licensing.

The leader-follower concept is one in which the winning development contractor is given sufficient incentive to develop a second source, who then competes for a share of the follow-on production. This technique has been applied to the engine, guidance components and airframe for the Air Launched Cruise Missile. A variation of the same approach which we refer to as co-development teaming, is planned for production of the Airborne Self-Protection Jammer (ASPJ) currently entering full-scale development. In this program, two teams, composed of two companies each with the capability of individually producing the complete system, are competing in the system development. This competition will culminate in selection of a single team to complete the development phase. This single team will then be split for competitive dual source production. These and other techniques are being used to tailor a specific acquisition strategy that will maximize competition for each major system.

We are investigating the start-up time required for competition, the effects and costs of competition, and the feasibility and costs of improving program stability. The lack of program stability has been often cited as a major disincentive to competition.

We are reviewing all DoD policies, regulations, directives, and instructions to identify those that could inhibit competition. We realize that some of our policies on mobilization and standardization and the extensive investments in unique production facilities on many major systems restrict competition for good and valid reasons. We also recognize that proprietary rights and the need to purchase spare and repair parts for equipment sometimes limit our competitive options. However, we believe there are many other instances where we can develop competition with a reasonable investment. We will continue to encourage our buying commands to identify these cases and make the initial investments required.

We are working with the Military Departments and the Defense Logistics Agency to identify programs where multi-year contracting would attract more competition or lower our costs. The B-52 ALQ155 ECM avionics and the GAU-8 ammunition are two such programs. We are also increasing competition through increased purchase of commercial items, by adopting non-government standards whenever feasible, by strengthening our spare parts break-out program, and by eliminating those aspects of solicitation and specifications that may be considered unduly restrictive.

B. AFFORDABILITY

The Department has taken significant steps in developing an affordability policy. Our problem for the past several years has

been that military requirements have dictated our placing more programs in development than we can efficiently produce and effectively deploy. This disparity between needs and resources creates compelling pressure to fund all programs at a reduced level with resulting schedule deferrals and stretch-outs. The result is an increasing backlog of effort, or the well known RDT&E and procurement "bow wave" phenomenon which serves to lengthen the acquisition cycle and incur greater escalation costs. A costly consequence of program stretch-out is buying systems at low, uneconomical production rates. This creates a cycle of higher unit cost and lower quantities for the funds appropriated. Such program upheavals have far reaching ill effects on established programming and contractual arrangements and on the relationships between the Military Departments and their contractors and between contractors and their suppliers.

Our affordability initiative is aimed at establishing programs that have some assurance of stable funding and therefore are less likely to suffer costly disruptions. This will make Defense a more reliable, hence, more attractive, customer in the market place.

In reviewing a proposed Mission Element Need Statement (MENS) we now ask ourselves, "What magnitude of resources we are prepared to commit to satisfying this need." The Department and industry agree that indicating the size of our "appetite" at Milestone "0" is very useful in focusing industry's talent on fiscally feasible alternatives during the conceptual phases.

During the past year better appreciation and understanding of this problem and its causes have been achieved through government-industry seminars and other dialogues. In the process we have

developed a policy within the Department which has made affordability a regular consideration at each Milestone decision. We have made visible the sponsoring Service's ability to adequately fund the program it recommends in the Five Year Development Plan and the out years. Affordability becomes, therefore, a function of military priority and the projected budgets for the applicable mission area. A responsible decision to transition a system from one acquisition phase to another is based on a fiscal capability to execute the program in an efficient manner as recommended to the Secretary.

Affordability is a potential issue at DSARC Milestones I, II and III, but particularly at Milestone II, where a decision to enter full scale development is tantamount to a decision to enter production if the development proceeds satisfactorily and if the threat endures. If adequate funds for the development and production of the system in question are not contained in appropriate programming and budgeting documents, we must ask whether we are serious about going ahead with this program.

C. INITIATING NEW PROGRAMS

The importance of conceiving and beginning new programs within the framework of sound acquisition policy cannot be over emphasized as we instill the major thrusts of competition and affordability in the early stages of the system cycle. The Mission Element Needs Statement (MENS) process is our primary tool for focusing on priority and affordability issues prior to significant investment. Now, three years after implementation of the MENS process, we are beginning to realize significant benefits even though we still have a number of new starts for which the SecDef has not approved a MENS. Since the

purpose of the MENS is to articulate and obtain consensus within DoD, that we have a valid need for which we are willing to budget and program significant resources, it is not surprising that reaching agreement is difficult. However, once a MENS has been extensively staffed within the Military Departments and JCS/OSD, and approved by the SecDef, it is more likely the requisite support and resources necessary for a stable program will be provided without costly "stops and starts."

Our experience indicates the MENS process is forcing potentially delaying issues to the surface earlier than they might normally have arisen. We do not see any evidence that the process has or should delay the acquisition cycle, albeit a delay in initiation might occur while the difficult issues of mission requirements, priorities, and affordability are being addressed. The payoff in terms of more stable programs after go-ahead will more than compensate for such delays. Eventually, all major acquisition new starts will have an approved MENS before funds are released. However, all on-going programs will not necessarily have a separate MENS approved since the issue of need is specifically addressed by the Secretary at each Milestone Decision.

We are examining our long range research and investment resource planning function with the objective of achieving a better alignment of our near term research and investment programs with out year requirements. In short, we want and need to develop an improved perspective of the impact of program initiation decisions on our resources and capabilities downstream. We expect our efforts to start bearing fruit within the next year.

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THE FY 1981 DEPARTMENT OF DEFENSE PROGRAM FOR RESEARCH, DEVELOP--ETC(U)

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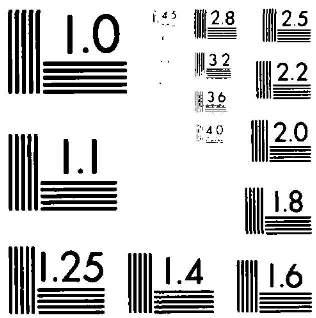

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963-A

D. ACQUISITION POLICY INITIATIVES

In the first part of this chapter we discussed the efforts expended at the start of the acquisition cycle in structuring technologically sound and affordable programs to meet our highest priority needs and beginning them on a competitive footing. The following paragraphs cover policy initiatives aimed at continuing our cost conscious management approach throughout the cycle while strengthening our industrial base.

1. Increased Opportunities for Small Business and Disadvantaged Business Concerns

This initiative has two facets:

- Small business and disadvantaged business concerns and firms in labor surplus areas are being provided increased opportunities to contribute to the defense effort through breakout. We are placing greater emphasis on identifying those components of major systems which can be subjected to competition.

- We have established definitive criteria needed to set-aside a procurement for exclusive participation by small firms. Further, once we have purchased a product on the basis of small business set-aside all future procurements automatically become set-asides.

- Our FY80 goal for contract awards to small business and disadvantaged business concerns is $500 million higher than our FY1979 performance of $12.2 billion. Similarly, our FY1980 goal for prime and subcontract awards to minority firms is $350 million higher than our FY1979 performance of $1.25 billion.

2. Improving the Contribution of International Acquisitions

As our efforts in the NATO RSI area begin to take eff we will be entering into a significantly larger number of "i national acquisitions." Our acquisition people at all levels in the Department must be adequately prepared for this new buisness environment. We must open new avenues to cooperation with our allies and

work around differences in the government to contractor relationships that exist in the NATO countries.

- We are going to look inward and assess our current policies, procedures, and personnel training with regard to contracting with foreign firms. Among other things, we visualize the need for "DoD International Acquisition Strategy" panels made up of experienced experts in our current NATO programs. These panels would serve in an advisory capacity to DoD program managers on structuring the next generation NATO cooperative development and production programs. In general, we need to do a better job of transferring "international lessons learned" among the Military Departments and will be developing a number of approaches to this problem. We will look to the Defense Systems Management College to be in the forefront of this effort, including expanding their basic course work on international program management.

- As we enter into more international acquisitions for the rationalization of defense equipment in NATO, we must find ways to conserve NATO government managerial resources by avoiding duplication of administrative effort. For example, where the DoD has a contract with a British firm, we should avoid both DCAA auditors and UK auditors performing almost identical audits in the same plant. We have recently signed an Audit Annex to the US-United Kingdom MOU on Reciprocal Defense Procurement relating to cooperative audit services.

3. <u>Developing the Federal Acquisition Regulation</u>

Under OFPP sponsorship and in cooperation with GSA we have been drafting a Federal Acquisition Regulation (FAR) for all executive agencies. The FAR will replace the Federal Procurement Regulation (FPR) and much of the Defense Acquisition Regulation (DAR). It will also be part of the uniform procurement system that OFPP must submit to Congress by 30 September 1980 under recent amendments to the OFPP Act. The DoD portion of the drafting effort is nearly complete and we have begun the review and analysis of industry, and public comments on the drafts. When both the DoD and GSA prepared drafts are revised

in response to comments, OFPP plans to issue the FAR by joint action with GSA under our respective procurement statutes. The FAR will be maintained by an interagency council and staff.

4. Linking Profit Policy to Increased Capital Investments

There is a notable lack of venture capital in the defense market. This is manifested in a relatively low level of facilities capital investment in the defense sector in relation to that of firms in the commercial sector. We recently modified our profit policy for negotiated non-competitive contracts to increase the return provided on capital investments in facilities. We believe this change will provide greater assurance that contractor investment decisions are not inhibited by our profit policy. This year we expect to implement new profit guidelines for labor intensive research and development contracts and service contracts. These new guidelines are intended to assure that research and development contractors are not penalized by our facilities investment oriented profit policy, which is designed primarily for manufacturing contracts, and to provide consistent policy coverage for service contracts which have previously been exceptions to our basic profit policy.

5. Contract Financing

In certain acquisitions, cash flow can be as important, or even more important, than profit in achieving more efficient performance or productivity increases. This is particularly true when working capital has a high cost and profit may not be paid until relatively late in the performance of a contract. Availability of cash early in a program may be a decisive factor in meeting

performance requirements or making investments essential to achieving long-term productivity gains. Accordingly, this year we intend to give greater recognition to the role our contract financing policy plays, or can play, in motivating defense contractors to achieve performance goals and increase their productivity.

6. Productivity and Responsiveness of the Industrial Base

We are continuing our emphasis on developing policy and programs to improve the management, productivity and responsiveness of the industrial base for both peacetime and emergency needs.

- o We are intensifying our efforts to reduce government-ownership of plants and equipment while expanding our reliance on the private sector.

- o We are developing techniques which will stimulate private investment in industrial plant equipment. This objective is to reduce peacetime item costs while incorporating measures to provide an improved production response to satisfy emergency requirements.

- o Our effort to induce contractors to acquire productivity enhancing equipment by including an investment protection clause in certain types of DoD contracts is succeeding. Under this clause, if the contract or program is terminated, the Government will "buy-back" specifically identified items of Industrial Plant Equipment at the depreciated value.

- o We are revising our Industrial Preparedness Program to more closely reflect today's potential emergency needs. The surge planning effort has been made a part of recently authorized Contract Data Item Descriptions which are used to obtain current and projected production data for critical defense items under peacetime and emergency conditions.

- o World-wide shortages of certain raw materials and backlogs in basic industrial operations have caused substantial lead time problems throughout industry. We are working to reduce leadtimes and their attendent costs particularly for major weapons systems through maximum utilization of the Defense Priorities System.

7. <u>The Defense Standardization and Specification Program (DSSP)</u>

The DSSP is continuing to provide dividends to the Department in terms of cost savings, increased reliance on industry and the market place, reduction of duplication, and improved operation and readiness of forces.

- o Adoption of non-government standards is accelerating. Some 2,200 private sector standards have been accepted by the Department of Defense, resulting in better use of proven commercial/industrial practices.

- o We have created a simplified form of performance oriented product description for commercial and modified commercial products. This form is known as the Commercial Item Description (CID).

- o Under U.S. Chairmanship, the work of the NATO Group for Materiel Standardization has been redirected to achieve standardization of NATO materiel through adoption of national and international standards for materials, parts and components used in weapon systems and military equipments.

- o Significant cost avoidances are being realized through the discipline of parts control. In a 12 month period the relative degree of standardization achieved was increased from 39% to 69%. The average annual net cost avoidance for this facet of standardization will be about $6.8 million.

8. <u>Embedded Computer Resources (ECR)</u>

Independent analysis estimates the total military software market at nearly $7 billion for 1979 with growth to $12 billion in 1985. Embedded software is about 75 percent of this total.

- o ECR interfaces are being standardized to allow timely technology updates (the technology half-life is only 10-20% of that of the parent system) and facilitate reuse of software across system boundaries. The press for a common programming language, Ada, continues on schedule. Concentration on a few Computer Instruction Set Architectures will further accent intersystem benefits and, simultaneously, improve the competitive situation.

- Contractor IR&D in the embedded computer arena is assessed to insure that DoD funded R&E is complementary.

9. New Approaches to R&M

We are reorienting our approach to reliability and maintainability (R&M). Separate requirements are being established for those R&M parameters that drive cost and are directly related to operational readiness, mission success, maintenance manning, and logistic support. Increased emphasis is being placed on early design, development and manufacturing tasks by which R&M parameters are achieved. We are reviewing the management of R&M growth during full scale development and initial deployment.

10. Acquisition and Distribution of Commercial Products (ADCP)

We continue to implement federal policy on the acquisition and distribution of commercial products notably in the high inflation cost areas of subsistence, clothing and textiles, and medical supplies. We have issued a DoD Directive on ADCP (DoDD 5000.37). We are staffing revisions to the Defense Acquisition Regulation. Wider use of commercial products will avoid development cost and reduce government specification drafting. Use of commercial channels for distribution will minimize government transportation and stocking costs.

11. Support and Manpower Considerations

One of our major R&D objectives is to develop new weapon systems which have reduced manpower and support problems compared to those we now operate. Our initiative entails focusing a substantial

share of our resources, talent and energies on exploring means to reduce the support (logistics and manpower) burden through clever design, fully developing the hardware R&M features, and by innovation in support concepts. The following steps are taken in a cooperative effort with the Assistant Secretary MRA&L.

- We are making early analyses of support cost "drivers", performing design tradeoffs to reduce support demands and establishing support related goals for both hardware and manpower while fully evaluating these factors in the OTE process.

- We have made a major revision to Integrated Logistics Planning (DoD Directive 5000.39) to focus logistic plans on readiness objectives, integrate manpower requirements analysis into the planning process, analyze support problems with current systems, and solicit innovation in hardware and support concepts from the contractors.

- Logistic review groups are being established in each Service to analyze support planning and potential support problems.

- The DSARC is more attentive to R&M parameters, readiness objectives, and support resources required for each new system. As a result the EF-111, XM-1, and Roland decisions were to expend additional resources to improve R&M prior to high rate production.

- The Services are making projections of outyear manpower and skill level demands which will result from fielding the weapons now in the development. These projections show increase in requirements to maintain some of the new systems--a trend which we are trying to arrest.

IV

IV. INTERNATIONAL INITIATIVES

A. INTRODUCTION

The past year has been one of consolidation and steady progress toward our goals of achieving more effective armaments cooperation with our allies in NATO and elsewhere, strengthening our technology transfer policies, and streamlining our export control practices.

Nothing that has happened during this year suggests any lessening of the steady increase in Soviet military R&D and procurement that I reported on last year. This makes all the more urgent the need to maintain our qualitative lead and, together with our allies, enhance in every possible way the collective return on each nation's R&D and procurement.

There are four principal mechanisms by which we can have a positive effect on the future military balance between ourselves and potential adversaries. These four mechanisms are:

- Real increase in our research, development and acquisition resources
- Direct support to enhance and exploit our fundamental domestic advantage in commercial technology and in our unsurpassed diverse industrial base
- Improved armament cooperation with our NATO allies
- Controls over the export of militarily critical technologies and critical products of direct military significance

The proposed increase in funding for research, development and acquisition of weapons systems, as I have described earlier, can have a significant impact on the first of these

mechanisms. In the following pages, I will discuss our efforts to enhance the output of the two latter mechanisms.

These efforts are closely interrelated. Cooperation in development and procurement of weapons systems, in NATO and elsewhere, involves a significant amount of technology transfer. The prudent transfer of this technology, in its military and its commercial applications, becomes a key consideration in determining the nature and extent of our participation in joint programs with our allies.

To enable us better to fulfill our responsibilities in the international area, we have revised our organization and established the Office of the Deputy Under Secretary for International Programs and Technology. In addition to giving added status and impetus to our work in NATO and other regions, this office centralizes DoD activities related to the transfer of militarily significant technology. The establishment of this office coincides with a period during which we have begun to realize an increase in accomplishments in the NATO arena. Perhaps the most concrete example is the increase in allied defense expenditures, where the majority of our allies have tried to match our pledge of a three percent annual increase in military funding. Advances have been made in readiness and interoperability. For example, we have added to and modernized our stock of anti-armor weapons, and have begun provision of chemical warfare protective equipment for individuals, units, headquarters, vehicles, aircraft and ships. Maritime command, control and communications have improved through the

fitting of a digital link on ships and patrol aircraft and the acceptance of U.S. and UK tactical secure voice communications systems for NATO-wide use.

Last year I described to you an investment strategy which sought to get maximum benefit from the most rational use of coalition resources in order to enhance NATO's overall military effectiveness. Three initiatives were then being launched: Memoranda of Understanding in arms development and procurement; dual production of existing systems on both sides of the Atlantic; and the Family of Weapons concept. I can now report a degree of progress which I regard as significant in each of these areas. More important, I feel that these efforts have achieved a momentum which is having an effect throughout our own and our allies' acquisition processes. This effect can be seen at one level in the October 1979 decision by the National Armaments Directors to endorse the adoption of NATO armaments planning review procedures. Another level is the series of seminars on weapons acquisition procedures which we are holding with industry and government representatives of several of our NATO allies. Throughout DoD, the Services are introducing NATO standardization considerations at the earliest stage of their system development cycle.

In Korea and the Middle East we have undertaken new initiatives designed to help our friends become better able to produce and support their own weapons.

Despite this evidence of progress, achieving weapons harmonization remains a complex and difficult task. Much work

is still to be accomplished and we will need the continued support of the Congress to keep these NATO initiatives on track. In particular, consistent Congressional support for those mutually agreed programs where we have significant international cooperative commitment wil' allow progress to continue to be made in these important areas.

In all of these initiatives, the sharing of technology with our allies and the prudent oversight of technology trade, worldwide, especially for dual-use technologies--those primarily commercial or civil in application but with significant military potential--play a pivotal role.

B. PROGRESS TOWARDS ARMS COOPERATION

Table IV-1 at the end of this chapter is a comprehensive summary of programs and activities underway that show progress toward improved cooperation in arms development and production. We provided a similar chart last year; this update shows the many additional steps toward greater cooperation that have taken place this year. Following are some of the highlights of the year's activities.

1. NATO - Related Programs

As I mentioned earlier, the triad of initiatives launched last year are just beginning to have their effect.

a. MOUs. General Memoranda of Understanding (MOUs) intended to facilitate industrial cooperation among the defense industries of participating nations have been negotiated with 10

countries: the U.K., Canada, France, Germany, Norway, the Netherlands, Italy, Portugal, Belgium and Denmark.

One very practical step we have taken to help put the general acquisition MOUs into action is the series of industrial seminars we are holding with government and industry representatives of signatory countries, to brief them on U.S. acquisition policies and procedures. At these seminars, we stress the reciprocity of MOUs, which means that U.S. bids on foreign requirements have to be treated on the same basis as the bids received from their own industries. As a result of these industrial seminars, several allied governments are trying to establish marketing organizations and to develop strategies on how to break into the U.S. market. Meanwhile, a U.S. delegation of government and industry representatives recently visited the U.K. to be briefed on U.K. acquisition policies and opportunities for U.S. industry participation in U.K. defense programs. U.S. representatives will participate shortly in similar industrial seminars with other NATO allies. One of the functions of our Office of International Acquisition is to answer questions and provide guidance to U.S. firms interested in penetrating European defense markets.

In addition to the general MOUs, we have negotiated and signed a number of programmatic MOUs with individual NATO nations for the cooperative development and/or production of specific systems. Among those recently signed are: an MOU with the FRG, France and the U.K. for a cooperative

program to develop a Multiple Launch Rocket System (MLRS); with Denmark and the FRG for full-scale engineering development of the Rolling Airframe Missile (RAM); with the U.K. for support of the U.S. AV8B development program; and with France and the FRG for the establishment and operation of a multi-national Aircrew Electronic Warfare Tactics Facility (AEWTF) in Central Europe.

We also have an MOU with Canada to conduct low-angle radar measurements at sites in both countries.

b. Dual Production. Another step which can bring the latest military technology capability into NATO's deployed forces in the near term is dual production. Under this concept, once a nation has completed development of a system, it can license the system for production by other allied nations. This method should reduce the high costs of duplicative R&D while increasing standardization.

Figure IV-1 is a list of U.S.-developed weapons systems that we have offered to the Independent European Program Group (IEPG) for dual production in Europe. Of these, AIM-9L is being dual-produced by a European consortium (FRG, U.K., Norway and Italy). MODFLIR, a night vision device, is the subject of an MOU with Germany, and the Germans will begin to produce MODFLIR as a component of several of their weapons systems in 1980. An IEPG panel has approved STINGER as a co-production

candidate; it is a man-portable air defense system. Similarly, the U.S. is now reviewing several European-developed systems that we may wish to adopt for production.

c. Family of Weapons

Progress is also being made in the third of our NATO initiatives, the Family of Weapons. Under this concept, we deal with operational requirements that can only be satisfied by a family of related weapons. Here, too, the purpose is to save R&D resources. When the mission needs of either the U.S. and/or Canada and at least one of the member states of the IEPG coincide, both in time and in required capability, the U.S. or Canada would develop one of the required systems in the family, while one European country or a consortium of IEPG members would develop the complementary system.

To date, we are moving toward agreement with our allies on two initial families of weapons: anti-tank guided weapons (ATGW) and air-to-air missiles. We expect to conclude agreements on these families in the spring and summer of 1980.

In the ATGW family, the European nations would be responsible for the development of a long-range, vehicle mounted system, while the U.S. would be responsible for a medium-range, man-portable system. In the air-to-air family, the European nations would be responsible for the next generation advanced short range air-to-air missile (ASRAAM) while the U.S. would be responsible for development of the advanced medium range air-to-air missile (AMRAAM). Details about these and other programs which

FIGURE IV-1

U.S. DUAL PRODUCTION CANDIDATES

ARMY

MODFLIR	-- NIGHT VISION EQUIPMENT
PATRIOT	-- AIR DEFENSE SYSTEM
STINGER	-- MAN-PORTABLE AIR DEFENSE MISSILE
HELLFIRE	-- HELICOPTER-BORNE ANTI-TANK MISSILE
IFV	-- INFANTRY FIGHTING VEHICLE
SOTAS	-- STAND-OFF TARGET ACQUISITION SYSTEM
VIPER	-- LIGHT, SHORT-RANGE UNGUIDED ANTI-TANK ROCKET
M-735	-- 105MM ARMOR PIERCING FIN STABILIZED DISCARDING SABOT TANK GUN AMMUNITION
COPPERHEAD	-- 155MM CANNON LAUNCHED LASER-GUIDED MUNITION
M-483A1	-- 155MM ARTILLERY IMPROVED CONVENTIONAL MUNITION (ICM)
RAAM	-- 155MM REMOTE ANTI-ARMOR MINE
ADAM	-- 155MM ARTILLERY DELIVERED ANTI-PERSONNEL MINE
AAH	-- ADVANCED ATTACK HELICOPTER
BLACKHAWK	-- UTILITY TACTICAL TRANSPORT AIRCRAFT SYSTEM

NAVY

AIM-9L	-- AIR-TO-AIR MISSILE
HARM	-- HIGH-SPEED ANTI-RADIATION MISSILE

AIR FORCE

JTiDS	-- JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM

are receiving increased NATO emphasis are given in Chapter VII, Tactical Programs, and Chapter VIII, Defense-Wide C^3I.

In addition to the steps being taken under this triad of initiatives, we continue to pursue other efforts to develop a feasible approach to long-range weapons planning for NATO. The NATO Armaments Planning Review has just become a regular part of NATO procedures. A planning process which would focus on harmonization at the earliest possible stage--the definition of requirements--is currently undergoing a series of trials under Conference of National Armaments Directors (CNAD) auspices. NATO member nations are currently reviewing nine mission need statements on a trial basis as part of this proposed Periodic Armaments Planning System (PAPS). These long-range efforts are the ones which ultimately should lead to the institutionalization of weapons harmonization throughout NATO.

One of the most far-reaching activities undertaken at the behest of the NATO defense ministers based on the recommendations of a Long-Term Defense Plan Task Force Report is the Air Defense Planning Group (ADPG) program. This is a comprehensive program that includes all air command and control (both offensive and defensive), NATO Airborne Early Warning, NATO IFF, Multi-Functional Information Distribution Systems (MIDS) and air defense weapons. This program will be the long-term (15 years) blueprint for the total improvements in the NATO air defense capability. The U.S. has formed a shadow group (European Theater Air Command and Control Study - ETACCS) to follow the ADPG program

and to ensure unified U.S. inputs to this important effort.

2. Non-NATO Initiatives

Our efforts at cooperation in weapons development are not limited to the NATO arena.

This year we have developed with Egypt a number of programs of technical assistance to their defense industries. These programs are intended to further Egyptian capabilities to produce spare parts needed for support of equipment in their forces as well as to support the new equipment they are buying from us. This initial program for rockets, bombs, small boats, and F-4 support, should help minimize the economic burden on Egypt of maintaining adequate defense forces. At the same time, this initiative should strengthen their perception of the advantages of a long-term cooperative relationship with the United States.

With Israel, we have increased the scope of our past cooperation by formalizing a Memorandum of Agreement. Under this agreement, joint or cooperative programs of research and development will be pursued. The agreement also provides for removal of unnecessary restrictions in the sale of Israeli military products to the U.S. We expect significant gains from this increased access to mutual experiences and developments.

With Korea, we maintain a vigorous program of technical exchange aimed at helping the Koreans develop increased

self-sufficiency in supply and support of their forces.

Lastly, with Japan we are exploring a broader and closer technical relationship. We expect Japan thereby to fill an increasing role in its own self-defense while maintaining important standardization with us in major equipments.

C. TECHNOLOGY TRANSFER

Technology sharing with our allies is one of the most significant elements in our programs aimed at rationalization/standardization/interoperability. We must share with each other the technologies necessary for cooperative development of weapons systems. However, problems arise with respect to transfer of this technology to third parties.

Throughout our pursuit of weapons cooperation, a key criterion has been and continues to be prudent control of the transfer of militarily critical technology. DoD's primary objective in controlling U.S. technology exports is to protect our lead-time relative to potential adversaries in the application of technology to military capabilities. We must not export sensitive technology when its compromise could adversely affect the military balance.

Subject to this primary objective, we seek to minimize controls on non-critical end products to expedite processing of export licenses for such goods and services that would not run counter to this objective.

To better position ourselves for the rapidly increasing

load of work related to technology transfer, we have reorganized and expanded the responsibilities for international programs in my office. The Deputy Under Secretary for International Programs and Technology has the task of expanding and refining a comprehensive DoD policy for export control of militarily critical technology and technology products. In response to Congressional mandate expressed in the Export Administration Act of 1979, the Department of Defense is developing lists of militarily critical technologies for publication and inclusion in the export control regulations. We expect this effort to have a major impact on export control procedures. In support of this work, a foreign technology data bank is being developed in conjunction with the Department of Commerce.

At the same time, the International Programs and Technology Office is discharging its responsibilities with respect to constructive military technology sharing. The thrust of this new office is mainly to share appropriate U.S. military technologies with allies, at the same time protecting our national security interests. The key objectives here are to minimize duplication of effort, conserve scarce resources and ultimately to achieve the aims of standardization/interoperability. Other goals are to minimize unnecessary restrictions on trade; to improve the predictability and accountability of decisions; and to improve the efficiency and focus of munitions and foreign military sales export license processing procedures.

D. FOREIGN WEAPONS EVALUATION (FWE)

We will continue to select foreign nations' weapons and

technologies for technical/operational test and evaluation using $9.1 million of the Foreign Weapons Evaluation (FWE) funds requested in this year's budget. Since this is a DoD-managed program element, my office ensures that the programs selected provide the DoD with potential capabilities to satisfy real operational needs, fill voids in current inventory, or contribute a component or technology for which there is no similar U.S. alternative. Use of these funds includes lease or purchase of systems to be evaluated, modification of the systems to be tested or directly related equipment, technical and operational test support, test data reduction, engineering studies, and refurbishing costs related to returning test or test support systems to original configurations. Examples of on-going FWE programs are the USAF evaluation of two French weapons (Durandal and BAP-100) and one Canadian weapon (CRV-7) for airfield attack.

TABLE IV-1

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS AND ACHIEVEMENTS	STATUS
ARMY				
ROLAND	FR FRG Norway	Short range air defense system, developed by FR/FRG and will be produced by FR, FRG and US, intended to protect the Corps rear areas.	• FRG/FR/US established Joint Roland Control Comm to ensure max standardization • 90% of field-replaceable sub assemblies interchangeable	• Entered Production in Europe in 1977 • US Production initiated Oct 1979. • Norway plans purchase of US fire control unit. • FRG/FR/US joint improvement decision expected in early 1980.
COPPERHEAD	UK FRG IT	155mm cannon launched projectile, developed by the US, which gives ARTY systems capability to engage stationary and moving armored targets with indirect fire.	• Interoperability with non-US artillery systems • MOU with UK signed June 78 (FMS, or coproduction at UK's option) • Possible collaboration with FRG and IT	• Initial production decision approved in Nov 1979. • FRG and IT (UK/FRG/IT are developing FH-70 and SP-70 howitzer) were provided with copies of the US/UK MOU. • Possible FRG/US industry consortium to produce COPPERHEAD.
MOD FLIR	FRG IT Netherlands	Family of forward looking IR common modules (MOD FLIR) developed by US for use in target acquisition and fire control systems, e.g., TOW Night Sight (AN/TAS-4) and Tank Thermal Sight (AN/VSG-2), and AH-1S Telescopic Sight unit (M65).	• MOU with FRG signed April 78 (FMS and coproduction) • Same modules used in Navy and AF airborne FLIR's • Possible employment by many Allies	• AN/TAS-4 and AN/VSG-2 were fielded in Europe in 1979. • 2 competing MOD FLIR tank sight designs fabricated by US/German contractors and delivered to FRG for test. (TI/ZEISS design was selected as thermal sight for Leopard, Marder and Luchs vehicles.) • Pilot production of German made common modules scheduled to begin 1981. • MOU with FRG/IT/NE expected to be signed in summer 1981.
PATRIOT	Netherlands Belgium Denmark Greece FRG FR	Surface-to-air, medium and high altitude, air defense system designed to counter the field Army air defense threat of the 1980's and and 1990's.	• NATO RSI of air defense systems • MOU signed, Oct 78, by Netherlands, Belgium, Denmark, Greece, and US to determine preferred European option to acquire PATRIOT. • MOU signed by France and by FRG. 10 Jan 79.	• MOU nations have established multi-national PATRIOT Program Steering Comm and full-time management group. • Group recommendations regarding PATRIOT are expected in Apr 1981.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
ARMY (Cont'd)				
STINGER	All NATO Nations	Advanced man-portable air defense system (MANPADS), which is the follow-on to the REDEYE system. It uses a passive IR homing guidance system which operates independently after initial arming and launching by the operator. Some target engagement will be possible in all aspects. STINGER and Swedish RBS-70 (3 man team) are the leading contenders for future NATO MANPADS weapons.	• NATO RSI of short range air defense (SHORAD) systems. • Approved for production 1977—expected to be produced for NATO use. • IEPG reported in Oct 79 that STINGER dual production would be pursued in an IEPG panel.	• Expected to be fielded in early 1980's • Italy, Norway and Netherlands have expressed interest in STINGER sales or coproduction. • FRG has chosen STINGER and is formulating an acquisition strategy.
MLRS	FRG FR UK Italy	Multiple Launch Rocket System (MLRS/GSRS) designed to deliver large volume of ordnance in a short period of time against critical, time sensitive, area-type targets.	• NATO RSI of general support systems • US, FRG, FR, and UK signed an MOU for an MLRS cooperative development program. • US, FRG, and UK have signed a Military Equipment Characteristics Document for a MLRS terminally guided warhead.	• MOU signed in July 79. • Italy has expressed interest in joining MOU. • Congress supported MLRS accelerated schedule. and RSI efforts.
ATGW	All NATO Nations	Infantry Manportable Anti-Armor/Assault Weapons System (IMAAWS) Program, formerly known as the Close Combat Anti-Armor System (CCAS). A medium range man-portable anti-tank weapon which in combination with the European long-range vehicle mounted system will comprise a NATO family of anti-tank guided weapons (ATGW).	• NATO RSI of anti-armor systems • NATO has agreed to begin cooperative anti-armor system program family package.	• MOUs to exchange information on improvements to second generation anti-tank weapon systems and to exchange information on advanced anti-tank weapon system concepts are expected to be signed in spring 80.
M483	Netherlands FRG UK	155 mm artillery submunition projectile compatible with standard howitzers and propelling charges that will provide a significantly increased lethality over the standard high-explosive projectile.	• NATO RSI of artillery ammunition. • Conforms to a 155mm FRG/IT/UK/US MOU regarding ballistic parameters.	• MOU granting the Netherlands the lead in a NATO consortium to produce the M483 is expected in fall 80.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
NAVY				
NATO ASSM	UK FRG FR Norway Netherlands	NATO Anti-Surface Ship Missile (ASSM II) is a second generation system, similar to HARPOON in size and range, but will be able to accept varying modules within its configuration to meet different NATO nations requirements.	• NATO RSI of anti-surface ship missile • NATO Project Group 16 of Naval Armaments Group working on coop development of second generation anti-surface ship missile.	• Joint feasibility study conducted and Interim Phase MOU signed to evaluate study results. • Negotiations now underway for next stage, Project Definition. This is European led effort with UK, FRG and FR having major roles. • US is an observer in the Project Group with no funding commitment.
IRST	Canada Denmark FRG FR UK Netherlands Norway Italy	Shipboard IR Search and Track System (IRST). Joint US/Canada three-phased program, under MOU, signed in 1976. Phase I—demonstration of feasibility to form basis for providing operational capability. Phase II—T&E. Phase III—procurement.	• NATO RSI of electro-optical devices. • NATO Project Group 15 to consider coop development and production of IRST. • Strong possibility that other NATO nations will participate in IRST development and procurement phases.	• NATO Project Group 15 still considering MOU for interested NATO nations providing financial support to US/Canada IRST engineering development (ED). • OT IIB sea trials successfully completed aboard USS Kincaid in Nov 79. • OSD has suggested USN reprogram funds for IRST ED. However, Navy suggests in FYDP that funding for ED start-up be delayed until FY 81. • Navy FY 80 plan is to analyze IRST addition to specific classes of AAW-capable ships to confirm expectation that IRST will upgrade these ships significantly at relatively low cost.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
NAVY (Cont'd)				
P-3 ORION	Canada Netherlands Norway	Maritime patrol aircraft with mission of surveillance, location and attack operations against submarines and surface ships.	• NATO RSI of anti-submarine systems. • Study results indicate that P-3 is one of NATO's most effective and economical anti-submarine systems.	• P3B currently in use by Norway. • Canada contracted to procure modified P-3C version. (CP-140) • Netherlands has agreed to purchase 13 P-3C's.
HARPOON	FRG UK Netherlands Denmark Turkey	Anti-Surface ship missile which would be launched from ship, submarine, aircraft, or shore.	• NATO RSI of anti-surface ship systems. • *Currently in use by Netherlands, Demark and Turkey.* • UK and FRG will take deliveries on their *purchases starting in CY 1980.*	• UK negotiating to buy sub-HARPOON, a variant of the US Navy's HARPOON missile. Changes to the HARPOON to meet the UK requirements will cost the British an additional $72M in R&D.
PENGUIN II	Norway Greece	Norwegian PENGUIN MK 2 system provides combatant craft and patrol boats with means to launch surface-to-surface anti-shipping missiles against surface vessels.	• NATO RSI of anti-surface ship systems. • US Navy negotiated MOU with Royal Norwegian Navy (RNON) on test and evaluation project to adapt PENGUIN MK 2 to US Navy combatant craft. • PENGUIN MK 1 was developed in 1962-1970 by RNON, with US Navy participation.	• MOU signed Apr 79 for US test and evaluation of PENGUIN. • Missile and system have been employed by RNON since 1972. • MK 2 system is now *in production for the RNON and* other European countries.
NATO SEASPARROW	FRG Italy Belgium Denmark Netherlands Norway	Point defense missile system, which includes fire control radar, launcher and a variation of the SPARROW missile intended to provide point defense to various classes of ships.	• NATO RSI of naval point defense systems. • MOU, signed in 1977 by US, FRG, Italy, Belgium, Denmark and Netherlands to form consortium to produce NATO SEASPARROW. • As of Dec 79, 28 U.S. ships and 21 NATO consortium ships have NATO SEASPARROW.	• Installation in all Consortium ships expected to be completed by FY 85. • US now developing SEASPARROW RIM-7M (monopulse) missile as a system improvement. It will be made available to other members of Consortium. • SEASPARROW is administered by a NATO project *steering committee.*
ROLLING AIRFRAME MISSILE (RAM)	FRG Denmark	Formerly the Anti-Ship Missile Defense System (ASMD), *the RAM missile is a fire and* forget system that will meet the naval requirements for point defense in a high *threat environment thru the mid 1990's. It will* provide increased firepower to supplement other point defense systems.	• NATO naval missile, standardization. Limit launching system to two variations. • MOU was signed in Apr 79 with FRG and Denmark for joint full scale ED (FSED), *following 2 years of AD by US and FRG.* • Other Consortium nations have expressed interest in the concept of providing a RAM *capability to their SEASPARROW launchers.*	• MOU for FSED program was signed in April 1979 upon completion of DSARC III. • Anticipated delivery date is FY 86. • Funding for the R&D is fully programmed through FY 85. • Belgium, the Netherlands, Norway and Canada have observer status in the program. • *An IR all-the-way seeker is being tested by the US.*

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
NAVY (Cont'd)				
ERMISS	FRG FR UK Netherlands	U.S. Navy participating in NATO project to develop Explosive Resistant Multi-Influence Sweep System (ERMISS).	• MOU, signed in 78 with FRG, FR, UK and Netherlands, which covers the initial 2-3 years of the ERMISS development.	• NATO steering comm overseeing ERMISS work chaired by US for first year. • Current R&D effort includes studies of mine explosion phenomena, ship propulsion, structural mechanics, seakeeping, structural concept development, materials application and shiploads.
AIM-9L	FRG UK Italy Norway	IR air-to-air missile to be employed on numerous NATO aircraft, including the F-16 and MRCA. A third generation missile which incorporates an all-aspect attack capability.	• NATO RSI of air-to-air missiles. • MOU, signed in Oct 77, with FRG to lead European consortium to co-produce the AIM-9L missile in Europe. UK, Italy and Norway are participating. FRG now arranging for manufacture of specific parts by each country.	• FRG has signed letter of offer for 1500 AIM-9L missiles. • The AOTD (fuze) for the missiles produced by the consortium will be purchased by FRG from the US at first. The AOTD may eventually be produced by the consortium in support of follow-on AIM-9L production.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
AIR FORCE				
F-16	Belgium Denmark Netherlands Norway	F-16 Multinational Fighter Aircraft Program is a joint development/production effort between the US and European Participating Governments (EPG's).	• NATO RSI of Fighter Aircraft. • MOU between US and EPG's was signed in June 1975. • Letters of Offer and Acceptance totalling over $2.8B signed in May 77 for purchase of 348 EPG F-16 aircraft and associated support.	• Standardization between USAF and EPG F-16's is being coordinated thru multinational F-16 Configuration Steering Group. Benefits of S/I will be achieved thru basing large number f USAF F-16's in Europe, as well as thru common logistics support base with EPG's. • Multinational operational T&E of the F-16 is being jointly conducted by US and EPG air crews in both US and Europe. Joint tests will enhance interoperability by establishing common training baseline, common tactics and employment concepts.
NAVSTAR	FRG FR UK Canada Belgium Denmark Norway Netherlands Italy	NAVSTAR Global Positioning System (GPS) is a satellite-based, universal positioning and navigation system. It was designed by the US to provide precise position information and time for accurate world-wide weapons delivery and reduce proliferation of navigation aids.	• Provide continuous world-wide, all-weather positioning system for NATO use. • MOU, signed in Apr 78, with nine Allies for NATO participation in NAVSTAR GPS. MOU created a NATO team located at the NAVSTAR Joint Program Office (JPO) LA, AFS Calif. • CNAD and the Tri-Service Group on Comm and Electr Equip (TSGCEE) created the NATO GPS Group (PG-1 under AC 302).	• 12 NATO personnel, including the NATO Deputy PM, are now in the NAVSTAR JPO. • NATO personnel have been integrated into the user equip. program management, and operational applications functional areas of the NAVSTAR SPO. • Entered FSED in Aug 79.
ATLIS II	FR	USAF has proposed joining the French ATLIS II pod development program to satisfy requirements for a near term, day, laser target designator for use by single-seat aircraft, such as the F-16.	• NATO RSI of laser target designators for aircraft. • Informal negotiations resulted in draft MOU for US to acquire 2 prototype pods for engineering and flight T&E in FY's 81 and 82. • ATLIS II, with US/FR interest now and possible UK participation later, could become part of the NATO family of air-to-ground systems.	• Congressional action approved reprogramming of FY 79 funds to support development of a laser designator POD for the F-16 and stipulated that a competitive procurement be established. USAF is implementing this directive. ATLIS II is expected to be a serious contender.
JP-233	UK	UK developed airfield attack system consisting of area denial and cratering submunitions for low-level high speed deliveries.	• Standardize upon single interoperable munition for airfield attack. • In interests of NATO RSI and the "two way street," the UK offered JP-233 to the US for coop development.	• US/UK initiated Full Scale Development (FSD) of JP-233 in 1977. • FSD phase expected to be completed in mid 1984.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
AIR FORCE (Cont'd)				
AWACS	Several NATO Nations	E-3A Airborne Warning and Control Systems (AWACS) combines sophisticated radar with advanced data processing and commo systems in a modified Boeing 707 aircraft to provide mobile, survivable, jam-resistant, wide area all altitude air surveillance command control.	• NATO RSI of AEW systems. • In 1975, NATO judged AWACS superior to other AEW candidates. • In 1977, UK began development of their own AEW aircraft (NIMROD). • MOU was approved at Dec 78 DPC. Congress approved our participation and funds for our share of program in 1979. • Development and production letter contracts signed Jan 1979.	• Total current program is for 18 US/NATO standard configured AWACS, mod of approx. 50 ground sites, refurbishment of main operating base and other facilities. • UK current program is for complementary 11 NIMROD aircraft and has agreed to make them interoperable with E-3A and NATO ground environment. • Production of AWACS, under NATO auspices, began in 1979, with first aircraft delivery to NATO in Feb 1982.
HARASSMENT DRONE (LOCUST)	Several NATO Nations	US/FRG developed LOCUST vehicle is an expendable vehicle designed to harass the enemy's threat radars by delivering a warhead to damage the equipment. It is a one way vehicle to eliminate post launch recovery and refurbishing problems.	• NATO RSI of Harassment Drones/EW systems. • NATO Long-Term Defense Program (LTDP) as the #3 priority program for improving the air EW capability of NATO in the 1980's.	• LOCUST will be equipped with payload to allow capsule to acquire, guide to and dive on a target. • Congress has approved FY 80 funding ($4.7M). • Full scale USAF/FRG codevelopment now underway.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
AIR FORCE (Cont'd)				
AMRAAM	All NATO Nations	Advanced Medium Range Air-to-Air Missile (AMRAAM) is an all weather, all aspect, radar missile capable of engaging numerically superior aircraft forces before they close to visual range. It will have compatibility for multiple launches at beyond visual ranges and become autonomous soon after launch to permit the launch aircraft to maneuver and/or engage more targets quickly. It is being developed as a follow-on to the SPARROW AIM-7F/M missile.	• For NATO family of air-to-air missiles, AMRAAM program initiated planning for early NATO industry participation in full scale development, leading to US/NATO coproduction. • AMRAAM NATO RSI plan has been developed. • Analyses indicated that USAFE fighter aircraft and EPG F-16's with AMRAAM's will have 70% of NATO's BVR capability. • AMRAAM will be compatible with F-14, F-15, F-16 and F-18 aircraft, as well as applicable Air Defense and Air Superiority NATO interceptor aircraft of the late 1980's.	• At the Apr 78 CNAD meeting, USDR&E (NAD) proposed as part of the air-to-air package that primary developer of next BVR air-to-air missile be the US, which has already begun its AMRAAM program. • NATO based foreign contractors are expected to participate as part of a European consortium and establish agreements with US contractors to be eligible as second sources in the production phase. • Initial exchange of aircraft/missile interface data requirements with FRG, FR and UK is in progress. • AMRAAM is currently in a competitive prototype phase with deliveries of the production item expected in mid 1980's. • AMRAAM is fully funded for the prototype phase leading to DSARC II. • Agreement in principle to sign a MOU was reached in Oct. 79. MOU signing is expected in Spring 1980.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
AMMO COMMONALITY				
155mm AMMO	UK FRG Italy	155mm weapons and ammo standardization with participating NATO nations.	• 155mm ammo RSI within NATO. • MOU with UK, FRG, Italy signed in 1969, revised in 1978. Revision requires participating nations to develop only 155mm ammo that meets criteria in MOU and that ammo and howitzer development conform to ballistic parameters in MOU.	• Testing to confirm interchangeability of newly developed ammo will begin in 1980 pending availability of new munitions. • Copies of MOU and required drawings have been provided in response to France's request for consideration in development of new howitzer.
120mm (Tank Gun)	FRG UK	US/UK/FRG program conducted for standardization of tank main armament systems.	• Tank Gun ammo S/I within NATO. • FRG 120mm smoothbore gun selected for XM1 as result of tests of US's 105mm, UK's 120mm rifled bore and FRG's 120mm, all firing improved ammo. • Configuration management working groups established for max S/I for NATO use.	• Terms of ballistic parameters have been provided to NATO through Panel IV of the NAAG. • US negotiated a license agreement with FRG for US production of FRG's 120mm gun system. • FRG is expected to make a decision in spring 80 on FRG/US development of advanced technology 120mm kinetic energy ammunition.
20-40mm	UK FRG FR	Standardized families of ammo between 20-40mm calibers.	• Goal—that within 15-20 years NATO nations will have no calibers between 20-40mm which are not interoperable. • Ad Hoc Group of tech members of US/UK/FRG/FR has worked toward agreement on standard families of ammo between 20-40mm calibers.	• Agreement in principle upon which 20-40mm ammo families will be standardized. • Expected that MOA will be signed by participating NATO nations within next year. Agreement will insure that new rounds won't be developed without prior concent of member nations.
NATO Small Arms Ammo	Belgium Canada Denmark FR FRG UK Greece Netherlands Norway Luxembourg	NATO program for standardized interoperable small arms ammo within NATO.	• NATO S/I of small arms ammo. • MOU between eleven NATO nations for T&E and selection of second NATO standard small arms ammo, and if possible, a standard NATO infantry weapon. • NATO standard 7.62mm ammo will continue as NATO standard round, for primary use in medium machine guns.	• International Test Control Commission (TCC) responsible to Coordinating Panel (representatives of each participating nation) conducted the technical and operational testing. • A one year operational test was conducted at Hammelburg, FRG, using approx 200 troops from six nations. • Final test report and recommendations due in NATO HQ on June 1980, with NATO decision scheduled for late 1980.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
Communications and Identification				
Identification (IFF) Systems	**All NATO Nations**	A capability for positive and reliable identification of friends or foes (IFF) is a need common to all weapon systems, especially those engaging targets beyond visual range. US participating in NATO-wide architecture and development of NATO Identification System (NIS) that will overcome shortcomings of current IFF.	• Achieve NATO IFF interoperability. • STANAG for signal architecture of NATO has been drafted by TSGCEE Project Group 2.	• FRG has conducted demonstration of experimental IFF system. • FRG development will be in coordination with US. • UK and other NATO nations are coordinating with US on proposed accelerated NATO NIS development program.

TABLE IV-1 (continued)

KEY NATO PROGRAMS

PROGRAM	ALLIES	DESCRIPTION	RSI GOALS & ACHIEVEMENTS	STATUS
Commo and IFF (Cont'd)				
Combat Net Radio	All NATO Nations	US has proposed, under auspices of the TSGCEE, NATO nations study, define and agree to NATO ECCM technical interoperability standards for VHF tactical single channel combat net radios (CNR) for post 1985 time frame.	• NATO interoperability of all combat net radio equipment. • US offered NATO nations participation in US funded SINCGARS V ECCM development and testing to provide them with threat, R&D and test data produced as well as ensuring NATO interoperability. • NATO Ministers agreed that all new combat net radio equipment introduced after 1985 would be designed to common specs, or common standards.	• US Army will continue program to develop SINCGARS-V to replace Army and Marine Corps tactical radios, and be interoperable with NATO combat net radios. • Discussions being held with FRG regarding T&E of FRG and US developed ECCM module for CNR. Additionally, several NATO nations have signed an MOU with the US to participate in evaluation of SINCGARS V. Result may be selection of one for NATO interoperability.
SATCOM	All NATO Nations	Satellite Communications (SATCOM) sharing between US, UK and NATO SATCOM assets to enhance NATO interoperability.	• Goal—Completely interoperable NATO Satellite Commo systems and ground terminals. • US and UK have made use of NATO satellites IIIA in the Atlantic area and NATO IIIB in East Pacific. • US has made limited use of UK SKYNET satellite to provide communications for special users.	• Effort now on-going to ensure next-generation of US and NATO SATCOM systems be completely interoperable. This will provide for contingency operations, as well as being the most economical for the US and NATO nations to achieve the required capability.
JTIDS	UK FR FRG	Joint Tactical Information Distribution System (JTIDS), in joint development by US, will provide means of interconnecting and facilitating real time, jam resistant, secure exchange of combat critical communications between tactical force elements.	• Goal—provide jam resistant communications systems interoperability within NATO. • As NATO nations adopt JTIDS, or introduce JTIDS compatible equipments, significant improvements in interoperability between tactical elements and NATO Forces will be achieved.	• Formal selection of JTIDS as jam resistant commo link for NATO airborne early warning aircraft (AWACS) must await achievement of frequency supportability. • UK provisionally selected JTIDS for NIMROD aircraft (next generation air defense fighter aircraft) and within elements of UK Air Defense ground environment. • FRG acceptance of JTIDS as standard system dependent upon frequency clearance in Europe. • Plans in preparation for test conducted in Europe.

V

V. THE SCIENCE AND TECHNOLOGY PROGRAM

A. INTRODUCTION

The DoD Science and Technology (S&T) Program is made up of the Technology Base, Advanced Technology Developments and the Manufacturing Technology Programs. In terms of budget categories:

- o The Technology Base consists of Research (6.1) and Exploratory Development (6.2) efforts;
- o The Advanced Technology Developments (ATDs) approximate 20 percent of the Advanced Development (6.3) category; and
- o Manufacturing Technology is funded primarily from the procurement appropriation, Industrial Preparedness (7.8).

B. OBJECTIVES

Our national security depends upon maintaining a research and development program which permits U.S. technical innovation in R&D and production to offset considerably larger Soviet defense expenditures. This program must also ensure against technological surprise by our adversaries. The S&T program provides the technology lead required to carry out such a program by three principal mechanisms:

- o Real growth in the S&T Program;
- o Enhancement and exploitation of our advantages in commercial technology and our industrial base; and
- o Improved cooperation with our Allies.

The continuing overall objective of the DoD S&T Program is to:

> Maintain a level of technological supremacy which enables the United States to develop, acquire and maintain military capabilities needed for national security.

For FY 1981 specific goals have been highlighted in the DoD S&T Program in support of this basic objective:

1. <u>Provide real growth in the Technology Base</u>

In the years from 1965 to 1975 the Technology Base budget was relatively flat in actual dollars, but decreased by approximately 50 percent when inflation is considered. In the last few years, this steady decline in real effort has been arrested and a small but steady real growth achieved. The funding for FY 1981 will provide for continuation of real growth in the Technology Base.

The decrease in real effort from 1965 to 1975 resulted in a substantial narrowing of innovative inputs into the program. Declining university and industry participation resulted in a corresponding reduction in such sources of innovation. Future growth will be used to increase the participation by universities and industry in providing sources of innovation.

The most essential function of the Technology Base is to provide the technological infrastructure which is so important to the steady, evolutionary growth of our military capabilities. It must be comprehensive and diversified enough to maintain our technological supremacy and lead time. As such, the Technology Base efforts of this type require a high degree of funding stability from year to year.

2. <u>Exploit the use of Advanced Technology Developments (6.3A) for more effective transition of technology to military systems</u>

Our Advanced Technology Developments Program is designed to decrease costs by demonstrating useful military applications of

technology and to shorten the time needed to apply the technology to military operational and support systems. It does this by one-of-a-kind demonstrations which do not need to meet all the military specifications. It is a relatively inexpensive way to select from alternate technologies, and to determine changes in applications which will make the technology even more effective.

3. <u>Expedite a selected set of technologies which are of prime importance for protecting technological lead time</u>

We have selected the following technologies for increased emphasis because of the potential they have for greatly improved military capabilities:

- o Precision guided munitions (PGM);
- o Very high speed integrated circuits (VHSIC);
- o Directed energy;
- o Advanced composite materials;
- o Manufacturing technology; and
- o Embedded computer software technology.

C. THE FY 1981 REQUEST

The FY 1981 request provides for 6 percent real growth in the Science and Technology Program. When considering growth within the various categories, it is important to note that the Army's and Navy's High Energy Laser Programs have been moved from the Advanced Technology Development category to the Exploratory Development category to more accurately reflect the risk and type of work being accomplished. Details are outlined in Table V-1.

Table V-1
Science and Technology Program (RDT&E)
(Dollars in Millions)

	FY 1980	FY 1981
Research		
Services	467	559
Defense Agencies	91	93
Total Research	558	652
Exploratory Development		
Services	1,162	1,405
Defense Agencies	541	667
Total Exploratory Development	1,703	2,072
Advanced Technology Developments	638	612
TOTAL SCIENCE AND TECHNOLOGY PROGRAM	2,899	3,336
Manufacturing Technology (Non-RDT&E)	158	150

D. MANAGEMENT OF THE DoD S&T PROGRAM

1. In-House Laboratories

In last year's statement we reported on the efforts that were being made to identify institutional barriers to efficient management of our DoD Laboratories. These laboratories play a major role in developing new technology for military applications, in providing technical advice to the system acquisition process (helping the DoD maintain a "smart buyer" capability) and in testing weapon systems components and subsystems.

The Report on Institutional Barriers to Effective DoD Laboratory Management has been widely circulated. The Secretary of Defense has chartered a DoD Laboratory Management Task Force to review Service initiated plans for replacement of multiple controls by a single integrated control on resources. Laboratory Directors will be given increased discretionary authority. Their performance in using this increased authority will be measured in the new Senior Executive Service Evaluation System.

The Civil Service Reform Act of 1978 also provided for experimental management models that can be used to test policy initiatives. The potentialities of this avenue are being examined in the DoD-wide Equal Opportunity and Affirmative Action Programs. Our DoD Laboratories can play a stronger role in strengthening U.S. Science and Engineering goals if we can attract more creative people into defense science careers.

2. Research

I have undertaken a number of management initiatives which will produce more effective coupling among the communities of government, academic and industrial scientists upon whose collective creativity we must depend. These initiatives include:

- A series of Research Topical Reviews in which DoD programs in a number of scientific disciplines are reviewed and discussed with leading scientists of government, industry, and academia in order to solicit new ideas and encourage wider participation in DoD research.

- The Services are placing greater emphasis on multidisciplinary "cluster" programs among the participating universities, with clear direction and coordination to be provided by designated top scientists serving, essentially, as project managers.

- A DoD-wide, uniform, simple (one page) contract for supporting research with universities and nonprofit organizations in order to lessen the administrative burdens of capable scientists.

3. Independent Research and Development (IR&D)

The industrial IR&D Program effort is an important part of our investment strategy and is a formidable device for teaming DoD with the American industrial sector. My primary purpose is to tap the competitive strength of U.S. industry, a resource without parallel in the Soviet Union. The IR&D Program currently involves annual corporate costs of about $2 billion, partly offset by DoD reimbursement of approximately $700 million, in projects highly relevant to the defense industry. The IR&D projects are highly leveraged in that they attract the highest quality corporate staff and are directed to programs with potentially high payoff.

Although I am satisfied that the IR&D Program remains a very sound part of our investment strategy, I have given special attention within the past year to an examination of means for further improving the program content without interfering with its independent character. I have completed a management overview of all IR&D activities, including a technical survey correlating IR&D with funded programs, and an assessment of the value of IR&D to our Technology Base, and I plan to make recommendations for changes in our management of IR&D in the coming year.

I am committed to continuing these efforts to develop an improved and aggressive program for the 1980's, and to do so in a manner consistent with retention of the independent character of IR&D and improved coordination with Congress and other Federal agencies.

4. Cooperation with Allied Countries in the S&T Program

Consistent with our overall thrust for increased cooperation with our Allies, there are two major S&T interfaces. The NATO Defense Research Group (DRG) and The Technical Cooperation Program (TTCP). In addition, we also support the Secretary's policy of encouraging:

> ". . . the transfer of critical technologies to countries with which the U.S. has a major security interest where such transfers can (1) strenghten collective security, (2) contribute to the goals of weapons standardization and interoperability and (3) maximize the effective return on the collective NATO alliance or other Allied investment in R&D."

An extensive cooperative program is underway with both the NATO and TTCP countries to collect and analyze atmospheric and target/ background data for our new night vision systems under typical adverse conditions. These data are being used as a basis for design of new NATO weapon systems and improvements in existing weapon delivery systems.

In addition, exchange agreements with our allies in the areas of a new canister for gas masks, ionization detectors and a high performance aircraft facepiece saved the DoD more than $2 million.

The Infrared Search and Track (IRST) is a US/Canada jointly developed passive infrared search and track system designed to detect antiship missiles. The system provides complete azimuth coverage and has the capability of providing passive surveillance of airborne and surface targets.

5. Energy Program

DoD's primary aim is to maintain the operational readiness of our forces regardless of energy supply conditions. DoD has established the following general energy RDT&E objectives in support of this aim:

- Broaden the range of mobility fuels which can be used in military systems, with primary emphasis on the increased use of domestically produced synthetic fuels; and

- Promote energy conservation, with primary emphasis on the development of more energy-efficient propulsion and power generation equipment, and reduce the dependence of military installations, particularly remote bases, on petroleum-derived fuels.

This research and development activity, while closely coordinated with the Department of Energy, is a prime responsibility of the DoD.

E. PROGRAMS

As cited earlier, one of the key strengths of the DoD S&T Program is that it is responsive to technological innovation rather than operationally perceived requirements. At the same time, the

inventive creativity and innovation which it supplies to DoD is properly confined within the bounds of DoD's mission. A key management responsibility is to allocate resources within the DoD technology infrastructure to match DoD's emergent and existing mission needs.

1. Research

The DoD Research Program serves as a continuing source of new concepts and technological options for the solution of national defense problems. The program is by design long-range, multidisciplinary, and stimulates nationwide capabilities in defense problems.

In Research we attack a broad range of problems judged to to be of basic importance to our future defense posture. Our FY 1981 efforts will be highlighted by programs in such critical DoD technologies as advanced materials, emergent combat environments, microelectronics, fundamental physical limits, and improved survivability. Examples include:

ADVANCED MATERIALS

- o Electroactive polymers and nonmetallic conductors (possible "synthetic metals") for electrical/electronic devices;
- o High strength titanium alloys and methods for their processing and joining;

EMERGENT COMBAT ENVIRONMENTS

- o Improved understanding of the space environment and the chemical, electromagnetic, and optical properties of the upper atmosphere;
- o New methods of remotely measuring ocean depths and determining the presence of objects operating under the surface;

MICROELECTRONICS

- o Application of superconductive electronics to ultra-high speed signal processing;

- o Exploitation of on-chip integration of circuits for fast, precise signal processing on single chips;

FUNDAMENTAL PHYSICAL LIMITS

- o Definition of limits of particle beam generation and exo- and endoatmospheric propagation;

- o Fundamental understanding of the ultimate physical limits of conventional semiconductor devices and circuits;

IMPROVED SURVIVABILITY

- o Techniques to ensure rapid and precise human judgments and responses under stress and high workload conditions;

- o New concepts for remote control of systems and vehicles to enhance human safety and ensure sustained performance in hazardous operational environments; and

- o New biochemical methods for enhancing the survival and immunity of personnel exposed to chemical, radiological, and biological threats.

2. <u>Very High Speed Integrated Circuits (VHSIC)</u>

Planning for a major new initiative was started in FY 1979 on integrated circuits (ICs). Contractual efforts will start in FY 1980. The program will extend over a six year period, and the funding will average approximately $12 million per Service per year, for a total of about $210 million.

Technologically, the program is directed towards an end goal of developing advanced ICs for military systems of the mid-eighties and beyond. These ICs will have submicron feature sizes resulting in

over a 200-fold improvement in data and signal throughput rates. A single new IC will replace 50 or more present ICs. This will result in major savings in cost, weight, size and power compared to present systems, and an estimated ten-fold increase in reliability.

To insure more rapid transition to military systems, an interim goal has been established. In FY 1983, ICs with minimum feature sizes of 1.2 microns will be demonstrated. In the late FY 1983 to early FY 1984 time frame, these ICs will be used to build demonstration electronic processing units for military systems which have been identified by the three Services.

The program was initiated for two main reasons. First, an increasing divergence between the direction of the IC industry and the needs of the military is occurring. Industry has not focused on real-time, high-speed signal processing and the related high clock rates needed for military system requirements. Also, industry is not developing devices to meet military specifications or including fault tolerance and built-in test features in their architectural and design approaches.

The VHSIC Program is vitally needed to meet DoD's present and projected signal and data processing needs for its military systems. It will help focus U.S. industry on these advanced goals and provide fallout to U.S. industry in meeting commercial overseas competition.

3. Embedded Computer Software Technology Initiative

Dramatic increases in computer hardware capacity and performance coupled with equally dramatic reductions in cost, size and

weight have multiplied the number and complexity of command, control and signal processing functions we plan to incorporate in the next generation of military equipments. To fully realize the operational advantages which are expected from this hardware capability, corresponding advances will be necessary in the associated software.

A major new initiative will be undertaken to develop automated software technology to improve the responsiveness, reliability, performance, and cost of military systems throughout their life cycle. This initiative will complement and build on Ada, a tri-Service programming language effort now entering the prototype state which provides a common base for DoD software R&D efforts. The initiative will seek fresh approaches to the software art which emphasize clearly defined tasks that have high potential for dramatic advances in software characteristics of critical importance to military systems.

4. Manufacturing Technology

The Manufacturing Technology Program (MTP) reduces weapons systems procurement costs by advancing the state-of-the-art of generic manufacturing technology applicable to DoD weapons systems. Examples of recent accomplishments include:

- Reduction of production costs of crossed field amplifier radar tubes from $21,515 to $12,205 each. This translates into an estimated $900,000 savings on each AEGIS ship;

- Replacement of counter rotating, fully machined aluminum torpedo propellers with injection molded, fiberglass reinforced polyester propellers. Cost savings are expected to be approximately $1 million annually through FY 1987; and

- Fabrication of equipment for weaving multidirectional carbon/carbon reinforced reentry vehicle nose preforms. Fabrication time was reduced from 320 to 120 hours and costs cut from $22,000 to $8,000 per unit.

MTP management improvement activities planned for FY 1981 include:

- Maintaining emphasis on generic relevancy and the need for a clear track between project funding and eventual implementation.

- Improving documentation of program payback by implementing routine procedures in each Service for a post-project follow-up to identify benefits derived.

- Improving program control and dissemination/diffusion of project results by designing and implementing a tri-Service Manufacturing Technology computerized data base with information on a past, current and planned projects.

During FY 1981, MTP projects will address a wide range of manufacturing productivity enhancement efforts. Examples include:

- Reducing both the metal removal costs and the loss of scarce, high cost materials in metal chips by advancing near-net-shape forging processes applicable to difficult-to-forge alloys;

- Increasing the probability and reliability of detecting component anomalies by utilizing advanced inspection techniques such as filmless radiography and ultrasonics; and

- Applying computers to production control systems such as ion implantation of microelectronic material, analysis of X-ray images and directional solidification casting processes.

5. Adverse Weather Capability Precision Guided Munitions (PGM)

The major thrust in PGM technology will emphasize development of an autonomous adverse weather capability to reduce launch platform vulnerability. Autonomy requires accurate low-cost midcourse guidance systems in order to deliver the terminal seeker system to the point where it will be able to acquire and home on the target.

Last year a strapdown ring laser gyro (RLG) was captive flight tested to demonstrate an accurate inertial midcourse guidance capability. In FY 1980 and FY 1981 this concept will proceed into free flight demonstration in a long range surface-to-surface missile.

A concerted effort is needed in target and background signature characterization for millimeter wave (mmw) seekers. In FY 1980 and FY 1981 a joint Service background and target signature measurement program will collect, reduce and analyze data for use by seeker designers in government and industry so that the most effective signal processing schemes can be utilized.

Technological advances in high density digital processing, solid state transmitters, and high duty cycle unambiguous waveforms have caused renewed interest in development of cost effective synthetic aperture radar seekers with weather penetration capability superior to other concepts now under investigation. In FY 1980 a prototype "brassboard" seeker will be demonstrated against surface targets in captive flight tests and in FY 1981 a missile flight demonstration program will be pursued. Successful accomplishment of planned PGM tasks will make the technology for an adverse weather capability a reality by the mid-1980's.

6. Directed Energy

The High Energy Laser (HEL) and Particle Beam (PB) Programs may provide a new class of weapon systems which could revolutionize our tactical and strategic capabilities. In the nearer term, perhaps before the end of this decade, we may see high energy lasers in use on the battlefield. In the 1990's, we can expect to see them play a role in the air and in space. Particle beams also show a similar promise although the certainty with which we can predict their utility is lower because the basic feasibility of propagation has yet to be demonstrated.

The two major goals in the HEL technology program are:

(1) To advance rapidly the state-of-the-art, and

(2) To collect the lethality data needed to determine that such weapons can be cost-effective when compared with other, more conventional means for performing a military mission.

The Airborne Laser Laboratory will provide the next major lethality demonstration and will engage and kill air-to-air and surface-to-air missiles. Last year its laser was ground tested with good beam quality. Tests are scheduled for FY 1981.

Design of the High Energy Laser Systems Test Facility (HELSTF) at WSMR is complete and construction will be completed in October 1982. This site will provide the first major U.S. laser test facility and joint Service demonstrations using lasers are scheduled for the mid-1980's.

The DARPA high energy laser program continues to focus on space defense and is explained in detail in the section on the DARPA program.

To determine whether particle beam weapons are feasible, we are developing accelerators that will provide the very high particle energy and beam current necessary for definitive experiments in beam propagation through the atmosphere. The experimental test accelerator at Livermore was completed recently under DARPA sponsorship, and has achieved single pulse operation. Work continues to obtain the design goals of the system. Our next step is to extend the energy with the construction of the advanced test accelerator and conduct propagation experiments. Further details are given in the section on the DARPA program. Other efforts are devoted to critical issues in power generation, conditioning, and switching; beam interaction with material and target components; and beam pointing and tracking.

7. Composite Material Development

The tri-Service/DARPA thrust program is proceeding on schedule toward development and application of Metal-Matrix Composite (MMC) materials for a variety of military applications. In addition to more conventional applications, MMC materials show promise for an ever widening range of uses, including laser mirrors, lightweight gun mounts, submarine propellers and radar antennae. One of the early results emerging from this program is the demonstration of fiber-reinforced lead grid materials for submarine batteries. If this

demonstration proves successful, it can double the submarine battery replacement cycle to make it comparable with the nuclear core replacement schedule and reduce maintenance costs appreciably.

The coordinated Navy and Air Force program in erosion resistant Carbon/Carbon (C/C) composite materials is proceeding satisfactorily toward demonstrating improved survivability and accuracy of advanced reentry vehicles under adverse atmospheric conditions caused by severe weather and/or nuclear bursts.

Exploratory investigations are being conducted by the Navy and Air Force of the viability of C/C composite materials for application to the hot sections of gas turbines in place of superalloys. Inasmuch as these superalloys contain substantial amounts of cobalt and chromium, for which the U.S. is almost totally dependent on imports, the development of C/C composites for this application could relieve U.S. dependency on foreign sources.

8. Advanced Aircraft Technology

The Air Force has demonstrated the capability to independently control aircraft translational and rotational degrees of freedom by employing independent control surfaces for each response axis, on a specially modified F-16 aircraft. This in turn provides unique maneuvering capabilities including direct lift, direct sideforce and fuselage elevation and azimuth pointing independent of flight path. This capability, along with the development of modern aircraft flight control technology, incorporating digital computational techniques, has led to the concept of task-tailored handling qualities, resulting in reduced pilot workload and increased survivability. In FY 1981,

development will be initiated to integrate these advanced flight control concepts with advanced fire control systems on an F-16 test bed aircraft. The anticipated benefits from the integrated fire and flight control are a 2 to 1 increase in both air-to-air and air-to-surface weapon delivery accuracy.

The advantage of utilizing nonmetallic composite materials in helicopter rotor blades has been well demonstrated in several Army and Navy programs. The Army has initiated the Advanced Composite Airframe Program (ACAP) to develop this technology for application to helicopter fuselage structures. In addition to an estimated airframe weight savings of greater than 20 percent, ACAP technology is expected to significantly lower the cost of ownership of future helicopters, both through reduced acquisition costs and lower maintenance requirements.

Commencing in FY 1981, the Army will initiate a demonstration of an advanced helicopter flight control concept employing information transfer through fiber optics. This "Fly-by-Light" system will eliminate the hazards of electromagnetic interference of conventional fly-by-wire systems, particularly in aircraft constructed of advanced nonmetallic composite materials.

The Navy has recently initiated flight tests of the circulation control rotor (CCR). This advanced helicopter rotor system employs a unique trailing edge boundary layer control scheme and is capable of developing 25 percent more lift than a conventional rotor for the same installed power. In addition to the potential for heavy

lift application, CCR promises significantly lower rotor induced vibrations through the implementation of higher harmonic control. Flight tests of the CCR on an H-2 airframe will continue through 1981.

9. Energy Programs

The Energy RDT&E Program is structured to allow DoD to: (1) maximally utilize the synthetic fuels developed by the Department of Energy, (2) augment the ability to utilize hydrocarbon fuels of opportunity, and (3) reduce the amount of energy use through improved conversion efficiencies for existing systems.

The research and development involving the development of specifications and use of synfuels in military systems constitute a major part of the Energy RDT&E Program and are the sole responsibility of the DoD. To facilitate a coordinated DoD program in this area, a Defense Mobility Fuels Office has been established by the Deputy Secretary of Defense, who is the approving authority for major policy matters related to the Mobility Fuels Program. Also, there is currently underway a concentrated effort to accelerate the entire RDT&E effort to utilize synthetic fuels. This includes acquisition from the Department of Energy of test fuels required, development of engine test programs necessary to qualify synthetic fuels for military use, and the development of engines with multifuel capability for the DoD.

The new emphasis on energy conservation R&D has already had significant impact, not only on energy savings but in the development of more effective platforms and systems. For example: The Navy efforts have resulted in new hull designs and more maintenance-free

hull treatment systems. The Army has developed a new program, now used nationally, to design energy-efficient military plants. The Air Force has developed improved aerodynamic designs and more effective flight profiles.

10. Chemical Defense Technology

Deficiencies have been recognized by the DoD and the Congress in the chemical defense posture of U.S. forces. If planned procurement and training programs continue, an adequate defensive posture to survive and operate in a nuclear, biological and chemical environment should be attained even with present equipment items.

Research and development programs have been directed toward new or improved equipment in all critical areas: medical prophylaxis, therapy, and casualty care should improve treatment of nerve agent casualties; remote detection using new infrared and logic techniques will enhance early warning and detection capabilities; a new individual protective mask, individual decontamination kit, and innovative approaches to next generation protective clothing will provide better personal protection; collective protection for groups and a decontamination apparatus for vehicles and large area coverage is in development; simulant materials approved for human use are being developed to provide realistic training; and a new effort directed toward decontamination fluids and dispensing apparatus will allow improved mobility and logistics by facilitating decontamination of sensitive equipment, personnel and large areas. Limited efforts are being maintained in the development of binary munitions: a warhead for the General Support Rocket System and a 155mm projectile to

deliver an intermediate volatility nerve agent. Binary munitions, while maintaining a deterrent/retaliatory stockpile, would provide significant safety advantages in manufacturing, storage, surveillance, transportation and disposal operations.

11. Training Devices and Simulation Technology

The DoD S&T program is responsive to the need that increasingly sophisticated technological U.S. equipments be operated by personnel of the background of our volunteer force. A program goal is to reduce the numbers of people needed to man and operate equipments provided the services. To that end, automation, designs to reduce maintenance, advanced techniques for initial training and computer based refresher training are areas of special emphasis. This rapidly advancing technology also allows us to train when and where we want with increased safety and knowledge of results as experienced with the simulator for air-to-air combat, the A-7 heads-up display maintenance trainer, the Air Traffic Control operator trainer and the laser engagement simulators.

12. Medical Technology

Infectious diseases endemic to areas of strategic importance pose a substantial threat to contingency force mission accomplishment. Infectious diseases have been the major cause of man-days lost in every war in history. World experience in the last decade indicates a very serious deterioration in the control of several diseases of great potential military importance.

The DoD S&T Program includes emphasis on development of drugs and vaccines needed for prevention of military-significant

disease hazards. Maintenance of this unique technology base, primarily supported by the Army, is necessary to enable DoD to meet its world-wide commitment. The drug and vaccine development effort is being expanded, to address requirements related to improved nuclear, biological and chemical (NBC) defensive capabilities.

F. The Defense Advanced Research Projects Agency Program

The Defense Advanced Research Projects Agency (DARPA) serves the "corporate research" role for DoD. It supports research and technology development for multi-Service applications, potential new defense missions, alternative approaches to ongoing Service developments, and programs which lend themselves to centralized management. DARPA concentrates its program on technology efforts that have revolutionary implications and very significant potential payoff for future defense systems. Its overall mission is to aggressively pursue high-risk/high-payoff types of programs, and rapidly exploit successful developments. When developments have demonstrated the viability of a concept, the programs are transferred to a Military Service.

1. Highlights of FY 1980 Accomplishments

- Continuous Tracking of Simulated Quiet Submarine - Under The Anti-Submarine Warfare (ASW) thrust, a horizontal suspended line acoustic array was emplanted in the deep ocean and an acoustic projector simulating a current submarine was detected and continuously tracked.

- SIAM/AUSEX Demonstration - Significant technology demonstration objectives were achieved in both the Aircraft Undersea Sound Experiment (AUSEX) and Self-Initiated Anti-Aircraft Missile (SIAM) programs. At-sea tests of the AUSEX brassboard, a submarine towed-line acoustic array, processor and display equipment detected, classified and located aircraft successfully. Controlled tests of SIAM, a submarine air defense missile, at White Sands Missile Range demonstrated the guidance data processor and aerodynamics control systems; the seeker, which was mounted in a jet airplane and flown against helicopters, in a real clutter environment; and finally, the first test (in horizontal launch mode) of the complete seeker in actual missile flight.

- First Successful Test of Assault Breaker TGSM and Dispenser - During October-December 1979, a series of successful free fall flight tests were conducted with the two candidate infrared (IR) Terminally Guided Submunitions (TGSM's). The TGSM's were dropped from a helicopter, simulating the conditions expected for the terminal phase of missile delivery. This successful test, coupled with the completion and qualification of dispensers by sled test in late FY 1979, is a significant milestone which permits the initiation of fabrication of the Assault Breaker missiles for system demonstration in FY 1981.

- High Altitude, Two-Dimensional Thermal Sensor - The HI-CAMP thermal imaging sensor produced high quality two-dimensional thermal contrast signatures. This imagery is the first to be taken with a focal plane array making possible detection and measurement of targets in a continuous two-dimensional readout mode (much like the storage target of a television camera).

- Two-Color Focal Plane Array - Mercury Cadmium Telluride detection material was developed for two-color, passively cooled operation for missile surveillance and was demonstrated under the HALO program. Use of the mercury cadmium telluride detector array module resulted in integral background clutter suppression. This element is necessary to make advanced missile surveillance missions attractive with respect to risk and cost.

- Rapid Solidification Technology - Radial Wafer Blade - Rapid solidification processing (RSP) technology is being tested by the Air Force as an exciting new method of fabricating advanced-performance and cheaper jet engine turbine blades. Using RSP, blades can be fabricated from rolled wafers rather than by expensive casting processes. These wafers can be etched with cooling channels before diffusion bonding. The combination of advanced cooling and higher temperature RSP capability will enable, for example, the F-100 engine to either increase its durability or increase engine thrust without an afterburner.

2. Overview of FY 1981 Program

The following paragraphs highlight DARPA's major thrusts:

- Cruise Missile Technologies - The objective is to explore ways of increasing the capabilities of our

current and future cruise missiles. The approach is to pursue technologies that will: (1) yield greatly improved penetration survivability and an improvement in range-payload capability; (2) provide for guidance techniques which will reduce circular error probabilities permitting the destruction of fixed, high value strategic and theater targets with non-nuclear munitions; (3) achieve reduction in specific fuel consumption compared to conventional small turbo fans; and (4) develop and demonstrate a capability for predicting, measuring and evaluating target signature effects in order to resolve cruise missile defense and penetration issues.

- Space Defense - The overall objective is to develop high energy laser technologies for multiple space applications. During the past year the program continued in the development of key technologies, including a chemical laser, large beam expander and pointing accuracy. These efforts will culminate in demonstrations of laser and beam expander, as well as demonstration of required acquisition, tracking and precise pointing. Conceptual designs are presently being completed for a chemical laser based upon scaling of recently demonstrated high efficiency nozzle configurations. The concept definition phase has been completed for two competitive experimental efforts, one of which will be chosen to demonstrate pointing precision required for defense applications.

- Space Surveillance - A broad technology base in visible, infrared, and radar sensor technology is being developed for advanced surveillance missions from space. Technology development stresses infrared detector arrays with a high level of applications but manufactured on common integrated circuit facilities to promote low cost.

  The infrared technology for staring sensor systems is being applied in measurement and demonstration sensors developed by the program. The HI-CAMP instrument was the first utilization outside the laboratory of mosaic detector array technology and is providing future design information. The TEAL RUBY sensor is being constructed for a space experiment in FY 1982 to demonstrate strategic air vehicle detection from space. The Advanced Sensor Demonstration Program is being initiated to provide a sensor for launch incorporating key elements of the High Altitude, Large

Optics (HALO) technology and demonstrating the capability of the technology to perform the surveillance missions studied in the HALO Advanced System Concepts Program.

- Anti-Submarine Warfare (ASW) - Under the continuing SEAGUARD project, a low-frequency active source experiment was successfully conducted in the Pacific Ocean during October 1979, which indicates that submarine detection and localization appears technically feasible. The emerging very large scale integrated circuit (VLSI) microcomputer technology is being exploited to perform high computational data processing of multiple sensor inputs. In non-acoustic ASW, the effort to characterize the signature of submarines in the presence of the background noise field, has resulted in a highly successful experiment.

- Land Combat - Two major initiatives in the Land Combat technology area are being pursued. A DARPA/Army/industry initiative for a next generation of artillery capable of interdicting armor beyond line-of-sight, utilizing smart sensors without laser designators, involving a critical technologies demonstration program has been initiated. It will employ advanced infrared and millimeter wave seekers and a tube launched ramjet projectile for extended range. Secondly, DARPA has initiated technology development for a light-weight shoulder-fired fire-and-forget missile. It is based on the successful integrated infrared focal plane array seeker field trials conducted this past summer, which represented the first successful demonstration of focal plane array technology in a tactical environment. This program will be coupled with our advanced shaped charge warhead activity in order to provide a total capability demonstration of viewers, seekers, missile and lethal mechanisms.

- Air Vehicles and Weapons - The X-Wing V/STOL flight demonstration will enter a detailed design and fabrication phase this fiscal year. It completed a highly successful control systems full scale wind tunnel test in FY 1979. The Forward Swept Wing technology demonstrator will continue through a series of scale model wind tunnel tests of a flight demonstrator vehicle designed to provide confidence in the concept's capability to produce lighter and cheaper aircraft with superior performance. In the avionics area, both the Low Probability of Intercept (LPI) and Sanctuary bistatic radar programs are in the process of testing.

- Nuclear Test Verification Technology - Design work on an advanced data center to handle the unprecedented quantities of digital data was initiated last year and is proceeding rapidly. Progress has also been made in developing new methods for analysis of the more easily detectable, but more complicated, seismic signals at the reduced distances associated with a detection network. Development of an ocean-bottom seismic system is being initiated to further increase detection capability.

- Command, Control and Communications - The DARPA C^3 thrust seeks to increase the effective combat power of our forces through application of computer communications and information processing technology in strategic and tactical operations. Through a series of technology programs and application testbeds with the Services we will demonstrate the capability for enhanced survivability, mobility, security and overall reliability of our C^3 system.

  Packet Switching technology provides the basic computer communications capability and has been applied to satellites, ground radio and terrestrial nets (including AUTODIN II). An internetting technology has been developed to permit computers on different packet networks to interoperate; computer communication protocols are now being standardized within DoD for this purpose. A technology for supporting end-to-end secure communication over multiple networks using mixed voice/data/facsimile is under development.

  Several experimental testbeds are being used to evaluate innovative technology in a try-before-buy mode. These include the DARPA/Army Packet Radio Testbed at Fort Bragg, the Advanced Command and Control Architectural Testbed (ACCAT) conducted jointly with the Navy and the Strategic C^3 reconstitution experiment with the Air Force. The Battlefield Exploitation and Target Acquisition (BETA) program is a DARPA/Army/Air Force effort to develop and test a tactical intelligence "fusion" system.

- Charged Particle Beam - Feasibility of charged particle beam concepts depends critically on propagating electron beams stably over distances in the atmosphere. Low energy beam experiments indicate that a stable propagation window exists. Theoretical models which predict these results quantitatively have been extrapolated to full atmosphere density and have predicted a propagation window for beam energies. Therefore, a much higher energy Advanced Test Accelerator is currently being constructed to allow demonstration of propagation.

- Assault Breaker - The combined Warsaw Pact air and ground forces opposite NATO in Central Europe are capable of executing a minimal warning attack across the inter-German border with a minimum of mobilization. Current Soviet doctrine stresses the offensive and calls for forming their forces in echelons to generate and sustain attack momentum along major axes of advance. The Assault Breaker (AB) program is demonstrating the technology for a non-nuclear, standoff weapon system capable of engaging and destroying a force, thus negating this most serious Warsaw Pact threat in Central Europe. Necessary to the implementation of Assault Breaker is the capability of performing target acquisition and track of tank targets. DARPA is currently developing synthetic aperture radars with such a target acquisition and track capability. During this fiscal year initial imaging tests have proved that such accuracies are achievable. Also essential to this weapon system concept is the capability of developing a missile with its payload of submunitions. These submunitions, when properly dispensed, must be capable of acquiring, tracking and killing vehicular targets with no human assistance. DARPA has recently completed tests of critical technology necessary for the Assault Breaker weapon. A Steering Group consisting of Army, Air Force and DARPA members is formulating a plan for Service development, as appropriate, following the FY 1981 concept demonstration.

- Technology Initiatives and Seed Efforts - DARPA continues to be a spawning ground for innovative concepts and ideas which can have a major effect on reducing new weapons systems costs and yielding quantum jumps in Defense capabilities. Initiatives to establish advanced technologies for very large scale integrated (VLSI) circuits are increasing with the establishment of new device design and architecture concepts, the development of both interactive design capabilities and fast turnaround fabrication services on the ARPANET, and novel directed energy processing and lithographic techniques for fabricating submicron-size circuit elements. Basic computer science research is developing natural interfaces to distributed data bases, adaptive signal understanding technology for electronic warfare and related applications, and distributed sensor networks. Quantitative nondestructive evaluation techniques are under development to achieve inservice crack detection and monitoring of critical aircraft structures, to substantially extend the service life of high-cost turbine engine disks, and to provide a portable ultrasonic imager for the field inspection of aircraft and other high-value defense systems.

3. Program Balance - DARPA programs are conducted through contracts with industrial (65%), university and not-for-profit organizations (23%) in the private sector, and with selected Service R&D laboratories (12%). Its programs are executed through Service R&D organizations to augment technical review and coordination, and facilitate the eventual technology transfer to the appropriate Service. For FY 1981 DARPA's budget request is $563.4 million for its program. This budget is consistent with the size and growth of the overall DoD Science and Technology program. As shown in the following chart, the DARPA FY 1981 budget is almost the same percentage of the DoD Science and Technology program as it was last fiscal year and in FY 1971. Over the past 10 year period, the DARPA budget has grown by only 3.3 percent per year, when inflation is taken into account. As shown in the chart below, during this period, the research area has grown by only 1.9 percent, and the long-term Exploratory Development efforts have not grown at all. Emphasis in the FY 1981 budget is in providing priority support of the three congressionally assigned projects (i.e., Charged Particle Beam, Assault Breaker, and Strategic Laser Communications) and fully supporting the other major program demonstrations in the Experimental Evaluation Project.

Budget Summary

Major Programs	Agency Fiscal Year ($ in Millions)			Agency Trends % Real Growth	
	1979	1980	1981	FY 71-81 (Constant FY 71 $)	FY 80-81 (Constant FY 80 $)
Research	41.4	89.7	101.2	1.9%	4.6%
Exploratory Development	165.9	203.7	252.8	(2.5%)	14.7%
Experimental Eval. Projects	--	158.5	203.1	--	18.4%
Management Hdqtrs.	--	5.8	6.3	--	--
TOTAL AGENCY	207.3	457.7	563.4	3.3%	13.8%
Agency budget as a percentage of DoD Science and Technology Program	16.0%	15.6%	16.5%		

G. DEFENSE NUCLEAR AGENCY

The Defense Nuclear Agency is the DoD's principal source of nuclear effects knowledge and conducts a comprehensive research program to assess the survivability of our military systems in a hostile nuclear environment, to predict the lethality criteria for confident destruction of enemy targets, and to develop technological capabilities that will enhance theater nuclear force effectiveness. The DNA development and test program spans the entire range of DoD nuclear weapons effects interest. Major activities in FY 1981 include:

- Laboratory Radiation Simulators. A major thrust of the DNA program is the development of advanced radiation simulators to lessen our dependence on underground nuclear tests. In view of the potential limitations imposed on underground tests in the U.S. by a Comprehensive Test Ban Treaty, two major simulation facilities are planned. In the near term, a Satellite X-Ray Test Facility (SXTF) is being developed in which full-scale satellites will be test exposed to X-ray pulses in a simulated space environment with a planned IOC of FY 1984. In the longer term, DNA is conducting an aggressive program to develop a laboratory simulation capability for missile and reentry vehicle hardness verification now performed only using underground tests.

- C^3I Nuclear Survivability. The effect of nuclear weapon detonations, particularly those occurring at high altitudes, is of continuing concern to the survivability and endurance of military communications, command, control, and intelligence functions before, during, and after a nuclear weapon exchange. Such detonations can cause electromagnetic pulse (EMP) and radio propagation blackout over wide areas of the earth from only a few suitably located explosions, not necessarily relatable to an act of war. In FY 1981 DNA will complete an on-site support assistance program for NATO which has provided procedures, methods, and techniques used by the newly organized Survivability Section at SHAPE.

A program to assess critical circuits in a nuclear environment will also be completed in FY 1981. As infrared sensors develop more important roles in potential nuclear environments, DNA is continuing to develop the techniques for predicting and assessing the effects of nuclear weapon detonations on these systems.

- M-X Support. DNA continues its strong support of M-X in the areas of nuclear weapons effect environments, hardness data, and weapons effects simulation testing techniques with respect to missile fly-out, reentry, basing design, with specific emphasis on vulnerability issues related to the "race track" concept. Experimental activities include laboratory tests, high explosive field tests, and underground nuclear tests (MINERS IRON).

- Underground Test. Two underground nuclear tests will be conducted in FY 1980, HURON KING and MINERS IRON. The first is a test of the systems generated EMP (SGEMP) response of a complex satellite system in support of the DSCS III SPO. The second is a test of the MX booster and advanced RV components. The results of these tests will be analyzed in FY 1981 after the components and systems have been recovered. During FY 1981, DNA will initiate mining of the tunnel complex for HURON LANDING which is planned as the next full scale horizontal line of sight test and scheduled for FY 1982. It is anticipated that this event will primarily support the MX weapon system.

- Above Ground Blast and Thermal Testing. The next major high explosive test, MILL RACE, is planned for FY 1981. It is the first test of the MISTY CASTLE series. It will simulate the airblast from a 1 KT nuclear detonation and is planned for the White Sands Missile Range, New Mexico. This test is being conducted primarily in support of U.S. Army requirements with communication systems and operational weapons systems.

  During FY 1980 a thermal radiation simulation facility will be developed that will be capable of pure thermal radiation flux. In FY 1981 it is planned to use this facility to test items and components for the Army XM-1 tank program, Army NATICK Laboratories, Federal Emergency Management Agency, Strategic Air Command (B-52, B-1), and the Cruise Missile Program.

- <u>Strategic Nuclear Targeting</u>. DNA is conducting HE test programs aimed at improving our assessments of the nuclear vulnerability of various Soviet targets. These programs will ultimately impact U.S. evaluations of its strategic nuclear deterrence.

DNA programs on theater nuclear warfare and the survivability and security of theater nuclear forces are discussed in further detail in Chapter VII. The total DNA funding request for FY 1981 is $200.7 million.

VI

VI. STRATEGIC PROGRAMS

A. INTRODUCTION AND SUMMARY

The principal objective of our strategic nuclear forces is deterrence of a nuclear attack on the United States, our allies, or others whose security is important to us. We plan to maintain the deterrent capability of the TRIAD because separate forces with differing characteristics protect against breakthroughs in defensive technology and unanticipated failures in any one force component, thereby giving confidence that a large fraction of our strategic capability will survive and be capable of effective retaliation. We also intend to improve the flexibility and endurance of our strategic systems in order to prepare for the possibility of protracted nuclear war.

In the air breathing element of the TRIAD we are completing development and initiating procurement of the cruise missile. Its inherent penetration capability is so encouraging that we are convinced cruise missiles will assure the effectiveness of the strategic bomber force into the future. In addition, cruise missiles provide us with the capability to rapidly expand the capability of the air breathing element of our strategic forces should that be required. We plan to add ALCM to our current mix of SRAMs and gravity bombs on our B-52's, and to improve B-52 survivability, in order to make optimum use of the inherent flexibility of our strategic air breathing force. We are also investigating new technology bomber concepts, such as low observable designs, which could provide the basis for a follow-on to the B-52 in the 1990's.

The potential vulnerability of our existing silo-based ICBM force to a Soviet counterforce attack in the early-to-mid 1980's continues to be our major concern. Accordingly, rebasing a portion of our ICBM's for survivability is necessary if we are to continue to benefit from the unique advantages of the ICBM force (independence from tactical warning, endurance, reliable C^3, quick response, accuracy, rapid retargeting, high availability rate, and low operating costs). We are, therefore, continuing full scale development of the horizontal multiple protective shelter basing mode for M-X which was begun late last year. We are simultaneously continuing to evaluate alternative basing modes as directed by Congress.

The SLBM force continues to be our most survivable TRIAD element and our current actions are designed to provide even greater assurance of its enduring survivability. This will be accomplished through introduction of the longer range TRIDENT I missile which is being backfitted into POSEIDON submarines and will be deployed in the new quieter TRIDENT submarines.

We continue to rely primarily on strategic offensive forces to achieve strategic objectives. Our air defense forces are modest and we have chosen to dismantle our ABM defenses and rely on ABM Treaty constraints to avoid a mismatch with the Soviet Union. We are, however, placing emphasis on improving our warning and attack characterization capabilities. Long term developments are being initiated to provide adequate bomber and cruise missile warning and to achieve improved survivability and performance in the ground and space-based missile surveillance systems. Our Ballistic Missile Defense (BMD) technology

efforts are being expanded with a major new focus on development of an option for low altitude defense of our land-based ICBM's.

The Soviets currently have an operational capability to attack some U. S. satellites. The United States possesses no such capability. Since we are becoming increasingly dependent on space assets we cannot accept this asymmetry. Accordingly, the President has directed two efforts to work towards its elimination. First, a vigorous program to protect our satellites; second, the expedited development of the capability to attack enemy satellites. At the same time, the U.S. is holding ASAT arms control talks with the Soviets which could lead to a bilateral curbing of anti-satellite capabilities.

B. OFFENSIVE SYSTEMS

Our FY 1981 program for strategic offensive forces is structured to assure essential equivalence with the Soviet Union to deny them the opportunity to gain political or military advantage from their strategic forces.

1. Land Based Intercontinental Ballistic Missiles

The major thrust of our FY 1981 effort will be continuation of full scale development of the M-X system for long term survivability, upgrade of the MINUTEMAN III to effect higher yield, and better ICBM force command and control for the near to mid term.

a. M-X System

(RDT&E: $1551.0 Million)

The M-X missile uses three solid propellant booster motors having a uniform diameter of 92 inches. The fourth stage, or post boost vehicle, uses a liquid hypergolic propellant system.

The basing system for the M-X missile uses horizontal multiple protective shelters, augmented by a dash capability. Each M-X missile is contained in a transporter-erector-launcher (TEL) which will be able to enter any of approximately 23 shelters from a connecting surface road. A self-propelled shield vehicle will accompany the TEL until the TEL enters a particular shelter and will then visit the remaining shelters, pausing appropriately at each. Preservation of location uncertainty (PLU) will thus be established for the missile. PLU will be maintained or restored by repeating this TEL placement procedure or, in an extreme situation, by causing the TEL to dash to a new shelter location without use of the shield vehicle. The normal launch method is to erect the missile through the roof of the shelter; however, launch can also occur outside of the shelter.

The M-X system is verifiable under the terms of SALT II. Verification is achieved through a combination of design and procedure. There are removable verification viewing ports in the roof of each shelter, spaced so that no ICBM could be hidden in the shelter once the ports had been removed. In addition, the missile and TEL assembly and delivery procedures are slow, uniquely identifiable, and observable by national technical means of verification.

b. MINUTEMAN Improvements.

(RDT&E: $48.3 Million, Procurement: $130.9 Million)

The yield of the MINUTEMAN III warhead is being increased in order to provide improved missile effectiveness. Development of the new warhead and the Mk-12A reentry vehicle have been completed and deployment of a total of 900 Mk-12A's on 300 missiles is underway.

The present MINUTEMAN force can be launched on command from Airborne Launch Control Centers (ALCC's); however, missile alert status is unknown to the ALCC in the absence of communications from the ground Launch Control Centers. Moreover, they cannot be retargeted, beyond the limited pre-stored targets, from the ALCC. We plan to give the ALCC capabilities to determine missile status and to retarget missiles.

We are also upgrading the Launch Control Center communications systems by installing three new or improved systems: the Air Force Satellite Communications (AFSATCOM) System; the Survivable Low Frequency Communications System; and the Strategic Air Command Digital Information Network (SACDIN).

2. Sea Launched Ballistic Missiles

Deployed at sea, the SLBM force currently is essentially invulnerable to preemptive strike by opposing forces. However, this invulnerability is not absolute nor will it last indefinitely. We have, in the U.S., developed technologies which, if deployed in large quantities, could put a portion of the Soviet SLBM force at risk. We don't believe the Soviets are capable of exploiting these ASW technologies in the near term and, in any event, such a deployment would be very expensive and observable (so we would have many years' warning). Nevertheless, we believe it is important to continue those improvements in our SLBM forces which make the ASW task more difficult.

a. TRIDENT Program

(RDT&E: $115.2 Million, Procurement: $1990.7 Million)

The TRIDENT program will help insure the continuing invulnerability of the SLBM force. The TRIDENT ship design results from a deliberate effort to reduce the acoustic observables of a sea-based system while increasing its operating range and area. Every effort has been made to increase the time the system will remain at sea both by increasing the time at sea between upkeeps and overhauls as well as decreasing the planned overhaul period. Other features are reduction of noise, improved defensive systems, and a decreased dependence on outside electronic navigational aids which reduces the necessity for exposing the submarine to collect position information.

The improved range capability of the TRIDENT I missile will permit employment of the TRIDENT system in the northern Pacific Ocean and throughout the Atlantic Ocean. Initial deployment of the TRIDENT I missile occurred on a backfitted POSEIDON submarine in October 1979. Twelve POSEIDON submarines will be backfitted with the TRIDENT I missile by the end of FY 1982. Deployment on the first TRIDENT submarine is scheduled to occur in August 1981.

The FY 1981 program will continue the procurement of TRIDENT submarines and TRIDENT I missiles. We will also continue to explore the feasibility of improving SLBM accuracy and payload through improvements to TRIDENT I or through development of a larger TRIDENT II missile.

b. SSBN Survival

The principal technology effort for assuring the continuing survivability of our SSBN force is the SSBN Security Technology program. The objective of this program is to determine the limits of performance

of hypothesized ASW techniques based on SSBN signatures and operational characteristics. Both acoustic and non-acoustic techniques are assessed in analyses, laboratory experiments, and at-sea experiments.

In FY 1981, a critical experiment will be conducted to assess the detectability of SSBNs. This experiment will be an extension of earlier DARPA and Navy experiments. Development of countermeasures will be initiated as results of experimental efforts warrant.

c. SSBN-X

(RDT&E: $12.6 Million)

We are continuing conceptual design of SSBN alternatives which might provide systems of lower costs but with the capabilities and survivability required in our sea-based deterrent force. This effort includes feasibility studies of conventional and non-conventional (encapsulated missile) alternatives.

3. Air Breathing Forces

We continue to advocate the concept of a mixed force of manned bombers and cruise missiles for the air breathing TRIAD element since a mixed force is much more stressing to the defense.

a. Air Launched Cruise Missile (ALCM)

(RDT&E: $108.4 Million, Procurement: $571.1 Million)

By the mid-1980's the B-52/ALCM weapon system will constitute the primary force in the air breathing element of the TRIAD, providing an accurate, long range weapon; increased targeting and routing flexibility; and reduced B-52 exposure to present and postulated air defense systems.

To insure the development of the best possible missile,

a competitive development and flyoff was conducted between the AGM-86B (the Boeing ALCM) and the AGM-109 (the General Dynamics ALCM). The competitive flyoff program included B-52 performance evaluations with cruise missiles loaded, captive carry tests, live launches (ten flights per competing design), mid-air recovery, and survivability and vulnerability testing.

Source selection is scheduled for March 1980 after which the selected missile will complete an additional 19 flight development/ follow-on test and evaluation program. The last eight of these will be B-52G Offensive Avionics System/ALCM System integration flights. Substantial efforts continue in the development and production of digital data bases (TERCOM maps, terrain elevation data, and vertical obstruction data) to support mission planning and cruise missile employment.

Survivability testing has demonstrated that present cruise missile designs will defeat the present generation of Soviet air defense systems. If the Soviets successfully develop the necessary technologies for a system which could effectively defend against a mass cruise missile attack, we believe it would be the late 1980's until they could begin deployment. By that time, we will be able to improve our cruise missiles to deal with the improved air defenses. Survivability testing will continue in order to detect unsuspected vulnerabilities or weaknesses which could be exploited by an opponent and to provide the basis for improvements to the weapons now in development and for possible follow-on weapons.

On-going technology efforts show promise for additional

improvements in cruise missile range and survivability beyond those that can be accommodated by modifying the existing cruise missile designs. The Advanced Cruise Missile Technology (ACMT) program provides for the investigation of technology that could lead to a follow-on cruise missile with improved propulsion, signature reduction, and avionics.

The cost and schedules of all our first generation cruise missile programs are being carefully controlled by use of common management, testing, and components wherever possible. The result has been a highly successful and closely integrated development effort.

Details of the Ground Launched Cruise Missile (GLCM) and Sea Launched Cruise Missile (SLCM) programs can be found in Chapter VII (Tactical Programs).

b. Bomber Forces

For at least the near and mid term the penetrating bomber will continue to comprise a major element of our strategic nuclear capability. To ensure a capable B-52 force we will concentrate upon nuclear hardening, defensive electronic countermeasures versus the next generation Soviet threat, and lethal defense. We plan to complete the B-1 electromagnetic pulse (EMP) testing to determine the success of our hardening efforts. B-52 EMP hardening will receive heavy emphasis. Study efforts for the next generation penetrating bomber will concentrate on designs which achieve very low observables.

(1) B-52 Squadrons

(RDT&E: $142.4 Million, Procurement: $454.8 Million)

This program provides for upgrading the B-52 so that it can effectively perform its roles as a standoff cruise missile launcher

and penetrator. The largest effort is for improving the offensive avionics which will improve weapon system delivery performance, reduce support costs, and provide an interface to cruise missiles and SRAMs. The first aircraft is scheduled to be modified in early 1981. Also included in this effort is the analysis, test, and design of the B-52 for nuclear hardness. We plan to continue some upgrade of the existing B-52 electronic warfare (EW) suite to maintain effectiveness against current and near term predicted airborne interceptor threats.

(2) Bomber Penetration Evaluation (Previously B-1) (RDT&E: $30.7 Million)

The last and final phase of the B-1 R&D program will be completed with the evaluation of nuclear hardness capability. Flight testing of the ECM system on aircraft number 4 will be completed in FY 1981; the aircraft will then undergo EMP testing to demonstrate our ability to design and fabricate systems to withstand the anticipated nuclear levels.

(3) Strategic Bomber Enhancement (RDT&E: $15.1 Million)

This is a broad-based research program that focuses on technology demonstration, and advanced development in such areas as advanced bomber/aircraft concepts, new avionics technologies, new weapon concepts, and cruise missile technologies. Hardware demonstration is conducted in this program for subsystems and elements which are critical to advanced systems that may be deployed in the 1990's to support the air breathing element of the TRIAD. Unconventional penetrating bomber concepts, such as very low observable designs, are investigated

within this area.

(4) Advanced Strategic Air Launched Missile (ASALM) (RDT&E: $25.7 Million)

ASALM is a supersonic missile with long range air-to-air and air-to-ground capabilities. It will fill the need for a strategic bomber/cruise missile carrier defense against a Soviet Union AWACS (SUAWACS) and, as a follow-on to SRAM, will provide a capability against defended ground targets. The Propulsion Technology Validation (PTV) flight testing is progressing smoothly and should be complete by May 1980. Pending the outcome of the DSARC I now in process, the ASALM program will enter the next phase consisting of air-to-air guidance validation.

(5) KC-135 Squadrons (RDT&E: $23.6 Million, Procurement: $44.5 Million)

The increasing demands for aerial refueling support require advances to increase the utility of our current KC-135 tanker force. Therefore, we are continuing the modification of the first production reengined KC-135. This reengining would: permit large fuel savings due to more modern, high efficiency engines; increase the fuel off-load capability; reduce the environmental impact of operations; and permit safer operations from shorter, hence more numerous, airfields. Coincident with reengining we are developing an advanced refueling boom for greater flow rates and winglets for increased operating efficiency.

c. Cruise Missile Carrier Aircraft (CMCA) (RDT&E: $30.3 Million)

The CMCA program provides a hedge against unforeseen failure of the B-52 force or the need for a larger force of ALCM than can be carried on the B-52G/H's. We have continued our analysis and evaluation of candidate aircraft for this mission. Efforts this year will focus on establishing the utility of the Strategic ALCM Launcher. This advanced development program provides the option to move quickly into full scale development and production if the need arises.

4. <u>Advanced Ballistic Reentry Systems (ABRES)</u>
<u>(RDT&E: $110.9 Million)</u>

The Air Force managed ABRES program is the principal DOD effort in developing reentry technology in support of existing systems and in providing options for future requirements. ABRES is working closely with the Navy on Mk-500 Evader maneuvering reentry vehicle development in the event a Soviet BMD breakout should make deployment of the Mk-500 on the TRIDENT I missile necessary.

C. DEFENSIVE SYSTEMS

The basic elements of strategic defense consist of the surveillance and warning systems to detect and characterize hostile actions by strategic aircraft, missiles, or spacecraft, and the defensive weapons to counter these forces. Since the burden for deterrence is placed on our strategic offensive forces, only limited resources are being applied to developing defensive weapon systems. Nevertheless, we maintain a meaningful level of activity in this area to provide future options for defense should the need arise, and to be capable of effectively performing the surveillance and warning functions so that we can react to an attack in a timely fashion should deterrence fail.

Our warning programs are designed to improve our ability to detect and determine the character of a Soviet attack so that we could make use of available options for strategic response such as launching the alert bomber/tanker force. As a potential response to an increased Soviet threat to our land-based ICBM force, including M-X, one major focus of our BMD research and development program will provide us the option to deploy a BMD system should it be necessary to do so. In response to the Soviet anti-satellite interceptor we are developing technologies to make our satellites more survivable and have also initiated the development of an anti-satellite intercept system.

1. Warning

a. Bomber Warning

(RDT&E: $21.7 Million)

The Distant Early Warning (DEW) Line was designed in the 1950's to provide long range early warning of medium and high altitude bomber attacks. It has gaps in the coverage at low altitudes and is becoming expensive to maintain because of its age. We have completed a joint study with Canada to define options for a North American bomber warning system and are continuing our discussions with the Canadians to select an appropriate option and agree on an implementation plan; however, we have suspended our efforts to develop new sensors for the DEW line as a result of the FY 1980 Congressional actions.

To improve the capability of one of our warning systems and substantially reduce its operating costs, we have initiated the development of minimally-manned, technically improved long-range radars to be located in Alaska. The approach reduces the amount of equipment

and the number of personnel required at each radar station. In FY 1981, development testing of a prototype radar will be completed.

The most promising near term technique for providing long range, all altitude aircraft coverage of the coastal approaches to North America is the Over-the-Horizon Backscatter (OTH-B) radar. We are pursuing a technical feasibility program to assess this application of OTH-B radar. In 1981, the experiments at the site in Maine will be completed. A thorough review of these results will be conducted by the Air Force and OSD to determine if we should proceed with OTH-B radars for bomber warning.

Technology and concepts for space-based detection and tracking of bomber and cruise missile threats are being developed to establish the viability of this potential alternative to ground-based radar. Space-based radar and infrared sensing concepts, being pursued jointly by DARPA and the Air Force, offer the potential of increased warning time and reduced vulnerability. The TEAL RUBY space experiment, scheduled for 1983 launch, will provide proof-of-concept for space-based infrared bomber warning.

b. <u>Missile Warning and Attack Characterization</u>
<u>(RDT&E: $94.0 Million, Procurement: $96.4 Million)</u>

Recent studies have reaffirmed our need for reliable, survivable connectivity between warning systems and commands. Further, the option of launch under attack (LUA) and the need for more precise information in order to exercise appropriate responses to a strategic attack lead us to consider specific improvements to our warning radars

and our satellite early warning system.

Today we rely primarily on our satellite early warning system for immediate warning of a ballistic missile attack on CONUS. Ground-based radars such as BMEWS, PARCS, and PAVE PAWS corroborate satellite data and provide additional data for warning and attack characterization.

The satellite early warning system consists of three satellites deployed in geostationary orbit. While the system has performed admirably, it is nevertheless fragile. We have planned the development of mobile truck-mounted terminals (MGT), easily proliferated and indistinguishable from other Service vans, that will solve our fixed CONUS critical node problem. Improvements have been made to the satellite through the sensor evolutionary development (SED) task including extending the mean life of the satellite.

Satellite warning capability against ICBM attacks is reinforced by the BMEWS radars in Greenland, Alaska, and the United Kingdom. We plan to complete replacement of obsolete computers at all three sites and to upgrade the Thule, Greenland (Site I) radar to provide better attack characterization, especially for attacks against our MINUTEMAN force.

Early in FY 1980 we convened a DSARC to consider options for a follow-on satellite system. These options, concerned principally with survivability of space-based warning, have been carefully examined with respect to cost, risk, and availability. The results will be presented to Congress in the near future.

2. <u>Ballistic Missile Defense</u>

The Ballistic Missile Defense (BMD) program seeks to provide and maintain options for defense, maintain our lead in BMD technology, and encourage continued Soviet participation in strategic arms limitation efforts. By developing a broad technological base in BMD, we attempt to avoid any destabilizing technological surprise that might result from a Soviet lead. In addition, the BMD program provides valuable assistance in the evaluation of the U.S. strategic offensive forces and the assessment of Soviet BMD activity.

a. <u>Ballistic Missile Defense Systems Technology (RDT&E: $133.5 Million)</u>

The Systems Technology Program (STP) validates the performance of new concepts and technologies in a system context. This effort improves our capability to develop future BMD systems and preserves a minimum capability to initiate design and development of a system if required.

During the past year the Systems Technology Radar (STR) at Kwajalein continued to track ballistic missile payloads of opportunity and was tested against two dedicated payloads designed to evaluate the capability to eliminate returns from fragmenting tanks (bulk filter) and to discriminate RV's. This radar represents a major advancement in BMD radars over earlier versions such as those used in the SAFEGUARD system. The STR at Kwajalein will be us[illegible] to gather additional target signature data from targets of opportunity and two dedicated target flights.

A key component of the Layered Defense System (LDS), which [illegible] both exoatmospheric and endoatmospheric intercepts, is the [illegible] exoatmospheric interceptor. Although the benefits of this [illegible]eptor are great, we have not yet demonstrated that it is

feasible. A program to demonstrate the capability to destroy a reentry vehicle outside the atmosphere with a non-nuclear interceptor using a long-wave infrared (LWIR) homing sensor is underway. This program, the Homing Overlay Experiment (HOE), is a major thrust in the STP. During FY 1981 equipment design and component testing will continue with the objective of conducting the first flight test in 1982.

Beginning in FY 1980 we plan to increase our emphasis on resolving key issues associated with a small, Low Altitude Defense (LoAD) system. Analyses have shown that, if feasible, such a system could provide an effective and rapid response to assure the survivability of our land-based ICBM force in the event of a SALT breakout.

b. Ballistic Missile Defense Advanced Technology (RDT&E: $132.8 Million)

This program emphasizes the development and application of new technologies to reduce BMD costs, provide for more rapid deployment, and improve BMD performance. Major efforts are directed toward the development of conventional components such as radars, data processors, and interceptors; more advanced components such as mosaic optical sensors and laser radars; and the technology associated with BMD functions such as discrimination, tracking, guidance, and fuzing.

A technologically challenging component of the LDS is a forward acquisition missile-borne long-wave infrared probe that would perform the functions of warning and attack assessment. In FY 1981 the design and construction of ground-based equipment for a "hardware in the loop" simulation of critical functions will be initiated. This effort will be supported by data gathered on a series of missile-borne infrared

sensor flights at Kwajalein. This probe development will also be of general utility to our warning system development efforts. Another major effort in FY 1981 will be the continuation of the development of the technologies required to support the interception of reentry vehicles in the atmosphere with non-nuclear warheads.

3. Air Defense

(RDT&E: $9.7 Million, Procurement: $1.9 Million)

The emphasis of North American Air Defense continues to be to perform airspace surveillance and maintain airspace sovereignty in peacetime. In this regard, it is our objective to provide sufficient dedicated CONUS Air Defense forces to prevent unchallenged access to our airspace and to augment these forces in time of crisis with tactical forces to defend against limited bomber attacks.

The current North American Air Defense surveillance and control system is the aging SAGE/BUIC system which is costly to maintain because of large manpower requirements. To provide peacetime air surveillance and control at reduced cost and to provide an interface and transition to the E-3A (AWACS) for operations in time of crisis, we have initiated the implementation of the Joint Surveillance System (JSS). This system will collect aircraft returns from many available ground radars and process the data in Region Operations Control Centers (ROCC's). A total of seven ROCC's are to be procured: four are to be installed in CONUS, one in Alaska, and two will be procured by Canada. Each ROCC in CONUS will process data from a network of FAA and USAF radars located on the periphery of the U. S. This will permit phasing out a large number of existing USAF SAGE radars with a resultant savings in excess of $100

million per year in operations and support costs. The bulk of the procurement will be accomplished in FY 1980 and in FY 1981 the majority of the software and integration tasks will be completed. All of the ROCC's will become operational in FY 1982.

4. Space Defense

The U. S. has become increasingly dependent on space systems for the effective use of our military forces. Currently, U. S. space systems provide support through communications, reconnaissance, ballistic missile early warning, navigation, treaty monitoring, nuclear detection and monitoring, and weather reporting. Many of the functions provided by space systems are unique in that the support cannot be efficiently provided by ground-based or air-borne systems.

The Soviets have developed and tested an anti-satellite (ASAT) interceptor that has an operational capability against our satellites. The U. S., however, does not currently have an ASAT system, and an asymmetry exists. The President seeks a comprehensive and verifiable ban on ASAT systems, and we hope that negotiations on ASAT limitations lead to strong symmetric controls. In the meantime, however, we have placed emphasis on our research and development activities to increase satellite survivability against attacks should they occur, and to be able to destroy Soviet satellites if necessary.

a. Space Surveillance
(RDT&E: $51.6 Million)

The U. S. space surveillance network, known as the Space Detection and Tracking System (SPADATS), consists primarily of ground-based radar sensors. SPADATS can maintain the location of all important

satellites.

We are improving on and deploying additional earth-based sensors for the near-term and, for the far-term, we are pursuing those R&D efforts necessary for a space-based system. In order that we may detect and more readily monitor satellites, we are procuring a global five-site Ground-Based Electro-Optical Deep Space Surveillance (GEODSS) system. This system, when fully operational, will permit observation of satellites up to geosynchronous altitudes (20,000 nm) when lighting and weather conditions are favorable. Since there are fundamental disadvantages of ground-based sensors for accomplishing the space surveillance missions, I believe that the long-term approach for responsive surveillance up to geosynchronous altitude is the use of space-borne LWIR sensors. We are conducting research and development on the critical technologies, such as the LWIR sensor and the cryogenic cooler, for such an approach and will launch Shuttle borne experiments in 1983 and 1984 to demonstrate the feasibility of this concept.

b. Satellite System Survivability
(RDT&E: $33.3 Million)

Techniques available for enhancing satellite system survivability include proliferating the number of satellites that perform a given mission, designing satellites so that they are not easily observed and placing them in orbits beyond sensor surveillance range, hardening satellites against laser radiation, and employing decoys to deceive or a maneuver capability to evade an attacking interceptor. These are some of the concepts and technologies that are being pursued within our survivability program.

c. <u>ASAT Development</u>

<u>(RDT&E: $124.9 Million)</u>

The primary U.S. ASAT effort is the development of a high technology intercepter using a miniature vehicle. The design has the advantage of being of low weight and will be launched from an F-15 aircraft. As a low-risk hedge to this approach, a conventional interceptor design has been completed.

d. <u>Space Defense Operations Center</u>

<u>(RDT&E: $15.9 Million)</u>

Surveillance, satellite attack warning, and the command and control functions necessary to support either a response by our satellites or an ASAT attack of our own, must all be integrated into one center. Operational system specifications are being completed and hardware and software are being developed for the Mission Operations Center on a schedule to support the ASAT flight tests.

D. STRATEGIC C^3I

1. Strategic Requirements

The composition of our strategic forces is changing with the advent of new weapon systems. Full realization of the force capabilities being sought requires new initiatives in command, control and communications. Command and control functions must be survivable enduring and support force employment policy. Survivable, jam-resistant, and secure means of passing Emergency Action Messages (EAMs) and other information between the NCA and the strategic forces are required. Specifically, our bomber, missile, and SSBN forces must have dependable two-way communications with the NCA and force commanders, in support of strategic policy and for efficient management of the Secure Reserve Force.

2. Strategic Command and Control

a. E-4B Advanced Airborne Command Post (AABNCP)

The E-4B AABNCP is the best near-term prospect for achieving survivability of strategic command and control. Fixed command posts, even if hardened, are vulnerable to a concentrated nuclear attack. The E-4B AABNCP is a survivable emergency extension of the fixed command centers and provides higher confidence in our ability to manage strategic forces during a nuclear war.

Communications for the E-4B include SHF and UHF airborne satellite communications terminals, a high-powered VLF/LF terminal, and improved communications processing. These systems have anti-jam features and will support operations in a nuclear

environment over extended ranges. The improvements, when installed in the full complement of six E-4B aircraft, will also permit a substantial reduction in currently operational CINCSAC airborne radio relay and auxiliary command post assets.

The results of extensive evaluations of the E-4B test-bed aircraft have formed the basis for the final configuration. The test-bed aircraft has been refurbished for operational use and joined the National Emergency Airborne Command Post (NEACP) Fleet in January, 1980. Retrofit of the three current E-4A NEACP aircraft to the E-4B configuration is planned to be accomplished by FY 1982 and we are requesting $144 million for this purpose in FY 1981. Procurement of two new E-4B aircraft is currently planned for FY 1984 and 1985, leading to full operational capability for both the CINCSAC and NEACP missions in FY 1988.

b. Command, Control and Communications for MX Missile Force

We have initiated planning and development of means to assure positive control of the M-X ICBM force by the NCA at all times, with endurance commensurate with that of the M-X missile system.

c. WWMCCS Survivability and Endurance R&D Program

Recent studies have identified deficiencies in the ability of our C^3 system to support military operations in the late trans-attack and long-term post-attack periods. While a number of improvements to the WWMCCS are being implemented, deficiencies will

still exist in survivability and endurance of command centers and communications needed to exercise control of our strategic nuclear forces. A number of concepts designed to correct these deficiencies have been identified.

The purpose of the WWMCCS Survivability and Endurance R&D Program is to provide a systematic basis for assessing these concepts. Major emphasis will be on demonstration of the utility of the candidate corrective measures in field tests and exercises. Technical, operational and cost data will be gathered to support investment decisions.

d. E-3A Airborne Warning and Control System (AWACS)

If the North American continent is attacked by air, AWACS (described more fully in Section VII.G.) will provide the survivable and mobile command and control functions for air-defense intercept and augmentation fighter aircraft. AWACS regularly performs special airspace surveillance and air sovereignty functions in peacetime, in augmentation of the Joint Surveillance System.

3. Strategic Surveillance and Warning

Deterrence is strengthened if potential adversaries know that we can detect, assess, and react appropriately to an attack. Our warning systems must be able to detect and characterize attacks in progress and provide unambiguous, reliable, and timely information to the NCA for selection of the appropriate response. Major activities include:

- The early warning satellite and the Ballistic Missile Early Warning System (BMEWS) and PAVE PAWS, for warning and characterization of ICBM and SLBM attack, and

- The Distant Early Warning (DEW) Line and the Over-the-Horizon Backscatter (OTH-B) radar development, for warning of attacks by bombers and cruise missiles.

These programs were described earlier under Defensive Systems.

Strategic surveillance also includes the capability to monitor effects of nuclear strikes, both those of an enemy against us, and by our weapons against enemy targets. The need for strike assessment capabilities is intensified by our doctrine of flexible response.

Real-time assessment of a nuclear attack anywhere in the world will be provided by the Integrated Operational NUDETS Detection System (IONDS). The IONDS concept involves deployment of sensors as secondary payloads on various host satellites, to detect, locate, and measure detonations of nuclear weapons, provide information via the World-Wide Military Command and Control System (WWMCCS) for estimation of strike damage, and contribute to nuclear test-ban treaty monitoring. We plan to install the IONDS detection sensors on NAVSTAR Global Positioning System (GPS) spacecraft, and we are requesting $12.1 million in support of the program.

4. <u>Strategic Communications</u>

a. <u>The Strategic Satellite System</u>

The Air Force Satellite Communications (AFSATCOM) system is designed to provide essential worldwide communications to strategic nuclear forces. The terrestrial segment consists

primarily of terminals on B-52 and FB-111 bombers, EC/R-135's, the E-4B, and TACAMO aircraft and at ground command posts, and ICBM launch control centers. Installation of the terminals is proceeding rapidly. The space segment consists of several components. One component is now operational and includes transponders on FLTSATCOM and Satellite Data System (SDS) satellites and other spacecraft. The next component will consist of improved SDS satellites and single-channel transponders on DSCS and possibly NAVSTAR GPS satellites.

We will need to replace and augment the links provided by FLTSATCOM satellites, which are not expected to function beyond the mid-1980s, and we need to provide means for all strategic force components to report status information to the NCA and strategic force commanders. We are now examining alternatives for the third component, the Strategic Satellite System (SSS).

b. TACAMO

TACAMO is our principal survivable link to the fleet ballistic missile submarines. Currently, a CINCLANT TACAMO aircraft is airborne at all times to insure that EAMs can be relayed to the Atlantic SSBM force. Deployment of TRIDENT submarines to the Pacific Ocean in the mid-1980s will intensify the need for a survivable EAM relay in the Pacific. We are taking several actions to achieve this capability. We have been modifying existing airframes to extend their useful service life, and procuring additional TACAMO aircraft to attain a fleet of 18 by FY 1983. We also plan to relocat the Guam TACAMO squadron to a West Coast base. Efforts to improve TACAMO

VLF/LF communications continue, and we are increasing TACAMO functional survivability. The FY 1981 reauest for the TACAMO program is $158 million.

c. Other Strategic Communications Improvements

The secure Voice and Graphics Conferencing (SVGC) program will provide a conferencing net for force commanders that will be capable of operation in a jamming environment. We are requesting $4.4 million in support of SVGC development in FY 1981, with production planned for FY 1985.

VII

CHAPTER VII. TACTICAL PROGRAMS

A. INTRODUCTION

Tactical warfare RD&A programs reflect the needs of our tactical forces in their fulfillment of our overall defense goals:

- That the U.S. and its allies achieve a better overall balance of military power vis-a-vis the USSR and its allies so as to deter hostile military actions.

- That we meet the greater risk of Third World crisis and conflict through better preparedness to counter such threats to our own and allied security interests, and

- That our Navy will continue to be the most powerful on the seas.

I will address the tactical programs briefly in the introduction and in some detail in the following sections.

1. <u>NATO-Warsaw Pact Balance</u>

In my FY 1980 posture statement, I outlined some critical characteristics of the Warsaw Pact threat and how our programs address them. I view the threat about the same now, but with some increase in its technological sophistication.

In the area of theater nuclear forces, we will, in concert with our allies in Europe, introduce highly accurate and survivable ground-launched cruise missiles and replace the Pershing Ia ballistic missiles now there with Pershing IIs.

To improve our non-nuclear ground forces for Europe, we are undertaking a major modernization program for the Army's weapons and equipment, adding armor, firepower, and tactical mobility. We are also prepositioning more heavy equipment in Europe to help us cope with attacks with little warning.

We will also improve our tactical air forces, buying about

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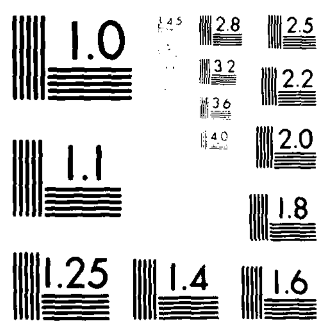

MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

1700 new fighter and attack aircraft over the next five years. We will maintain the current level of 12 deployable large aircraft carriers through the end of the century, and increase the number of Air Force wings.

We will accelerate the rate at which we can move fighters to Europe quickly to cope with a surprise attack, and add to the number of shelters at airbases there to prevent our aircraft from being destroyed on the ground.

2. Rapid Deployment

We are undertaking two major initiatives to help us cope with crises outside of Europe. The first will be a force of Maritime Prepositioning Ships that will carry in dehumidified storage the heavy equipment and supplies for three Marine brigades. These ships would be stationed in peacetime in remote areas where U.S. forces might be needed. The military personnel (and equipment not well suited to prepositioning) would be airlifted to marry up with their gear, and be ready for battle on short notice.

The other major initiative will be the development and production of a new fleet of large cargo aircraft able to carry military equipment, including tanks, over intercontinental distances into small austere airfields.

3. A Powerful Navy

To see that our Navy remains the most powerful on the seas, we are programming the construction of 97 new ships during the next five years. Within that total, we will be placing a relatively heavy emphasis on new guided missile ships to defend against attack from

the air. Our program includes three ships of new design that will assure future affordability and adequate fleet size, while still maintaining the fleet's fighting power. One will be a fleet escort vessel, another an anti-submarine frigate, and the third a nuclear-powered attack submarine.

4. Summary

Accomplishment of our goals by the implementation of the programs I outlined will be realized by prudent management and by pressing our technological advantage to develop and acquire sophisticated systems which, operating in synergism, can defeat a larger number of enemy weapons. The leverage of sophistication cannot, by itself, negate the large numbers advantage of the Warsaw Pact forces. It is therefore equally important that technology be also pursued to reduce costs, thus providing the option to buy larger numbers of weapons.

The sections which follow contain specific information about our major tactical RD&A programs arranged by mission areas.

B. THEATER NUCLEAR FORCES (TNF)

1. Introduction

Theater Nuclear Forces (TNF) constitute the link in the continuum between conventional and strategic nuclear forces and are intended to deter and, should that fail, to respond flexibly to blunt conventional and nuclear attacks at a level of conflict below strategic warfare. TNF can contribute to the conventional defense by placing the full range of Warsaw Pact forces at risk. They provide an incentive for dispersal of enemy forces; and the capability to attack a variety of selected targets throughout the theater. Through deployment of a spectrum of TNF capabilities and systems, we demonstrate that no decisive advantage could be gained by the first use of nuclear weapons in the theater.

Plans for the modernization of theater nuclear forces are being developed in close coordination with our NATO allies. It is important that NATO countries share in the planning, in the responsibility, and in the cost of TNF modernization. A coordinated approach contributes to Alliance cohesion and enhances the credibility and affordability of the overall NATO deterrent. During 1978 and 1979, the NATO Alliance made important progress in reaching decisions on TNF modernization, initially focused on deployment of Pershing II at a force level of 108 U.S. launchers, and Ground-Launched Cruise Missiles (GLCM) at a level of 464 missiles. In concert with NATO decision on modernization, we and our NATO allies have agreed on the outlines of an arms control approach to the Soviets on long range theater nuclear forces in the context of SALT II.

2. Battlefield Tactical Nuclear Warfare (TNW)

a. Strategy

Battlefield TNW systems are those generally associated with the Division and Corps level. Future systems in this category require enhanced (a) survivability, (b) responsiveness, and (c) accuracy.

Current NATO battlefield capabilities include 8-inch and 155mm nuclear cannon artillery projectiles, Lance surface-to-surface missiles, and dual capable tactical aircraft which deliver nuclear weapons at short ranges. We plan to retain these systems and increase their effectiveness by selective improvements in range and in warhead design.

b. Key Programs

(1) 8-Inch Artillery Projectile

A new 8-inch projectile, now in engineering development, will provide needed improvements in that it:

- o Requires no field assembly.
- o Eliminates the need for a spotting round
- o Has increased range (29 vs 18 kilometers)
- o Offers more yield options including enhanced radiation (ER).
- o Is more survivable.
- o Includes improved fuzing, safety devices and security features.

The FY 1981 budget request is \$2.0 million for RDT&E and \$19.8 million for procurement.

(2) Underlined: 155mm Artillery Projectile

A new 155mm artillery projectile is in an earlier stage of engineering development. This weapon will provide improvements in range, accuracy, yield, fuzing, and denial disablement features. The RAP module will provide a range of 30 km for the XM198 howitzer and 24 km for the M109A1 howitzer. Without RAP, the corresponding ranges are 24 and 18 km respectively. The FY 1981 budget request is $10.0 million for RDT&E.

(3) Nuclear Lance

Nuclear Lance is currently deployed with U.S. and other NATO forces. Improved Lance warheads will be produced with enhanced radiation features, if approved.

(4) Long Range 8-Inch Projectile

The feasibility of a long range (on the order of 70 km) 8-inch nuclear projectile is being studied. Development of such a projectile could enhance the capability and flexibility of U.S. and NATO cannon artillery in the late 1980-1990 time frame.

(5) Nuclear Corps Support Missile System (CSMS)

A study has been initiated to establish the need for, and general characteristics of, a new dual capable Corps Support Missile System with an improved circular error probable (CEP), survivability, and rate of fire (compared to Lance). $7.6 million is requested in FY 1981 for RDT&E.

3. Theater-Wide TNW

a. Strategy

Theater-wide TNW systems provide capabilities and options

for deep nuclear strikes as well as shorter range missions throughout the theater. This mission area includes land and carrier-based dual capable aircraft, the Pershing Ia ballistic missile and submarine-launched ballistic missiles allocated to the theater mission. The limitations, of the current force in conjunction with the increasing Warsaw Pact threat, prompted NATO's December 1979 decisions on long range TNF modernization of land based systems. Modernization of our theater nuclear forces includes:

- o Increase in the range capability of our systems.
- o Increase in system accuracy to enhance the capability to attack targets while minimizing collateral effects.
- o Improvement in survivability of TNF under nuclear or non-nuclear attack through greater mobility, increased hardness, and dispersal.
- o Upgrade of communications, command and control (C^3) systems to maintain responsiveness of TNF to military and political authorities.
- o Enhancement of security and safety of nuclear weapons against the spectrum of threats including terrorists, enemy agents, and special forces.

b. Key Programs

(1) Pershing II

Pershing II can be used for both selective or general nuclear release options against fixed targets such as lines of communications, logistics facilities, airfields, command posts and stationary tactical targets such as staging and assembly areas.

Pershing II, a follow-on to the shorter-range Pershing Ia (PIa), will use the PIa erector launcher. Upgraded ground support equipment will improve command and control and reduce manpower requirements. A new re-entry vehicle will incorporate a precision

terminal guidance system and an option for an earth penetrator warhead. RDT&E funding of $155 million is requested for FY 1981.

(2) Ground-Launched Cruise Missile (GLCM)

GLCM can be used in missions similar to those of Pershing II. Presently in engineering development, it will be deployed in a ground mobile mode to enhance prelaunch survivability. The Tomahawk missile will be integrated on an air transportable, ground mobile unit which, together with its launch control van, will be protected in its peacetime location by a hardened shelter. The advantages of the GLCM include its small radar cross section, very low altitude flight profile, high accuracy at long ranges, all-weather capability, and modern warhead. The operational range is 2,500 kilometers. $67.5 million is requested in FY 1981 for RDT&E and $97.2 million for procurement.

(3) Sea-Launched Cruise Missile (SLCM)

The SLCM program is nearing the end of its development. Tomahawk variants in full scale engineering development include the conventionally armed land attack missile, the conventionally armed anti-ship missile and the nuclear armed land attack missile. All Tomahawks will be capable of being launched from cruisers, large destroyers (DD 963 class), and nuclear attack submarines. We have accelerated the conventional land attack program. The FY 1981 SLCM development program will consist of operational evaluation of the conventionally armed land attack and anti-ship missiles. $130.2 million for RDT&E, $66.1 million for procurement, and $4.8 million for advanced procurement is requested in FY 1981.

4. Sea Control TNW

Sea Control TNW includes fleet anti-air, anti-submarine, and anti-surface ship warfare ASROC, SUBROC, TERRIER and air-delivered B-57 nuclear depth bombs. Research and development of new systems awaits the completion of an on-going policy analysis of the need and future role for naval nuclear systems.

5. Theater Nuclear Forces Survivability, Security, and Safety (TNFS3)

In October 1979, the Terms of Reference for this program were updated to ensure consistency with the overall TNF modernization effort. Increased safety considerations are to be incorporated into the survivability and security work under way. In coordination with the Services, priorities are being established for system S^3 enhancements to be pursued by the program.

The program's test and evaluation effort addresses the dual goals of (1) evaluating survivability and security enhancements, and (2) conducting tests and analyses that measure feasibility and applicability of these enhancements. Major R&D efforts in FY 1980 include development and testing of a prototype weapon vault storage system for weapons, and shelter vulnerability tests in which shelter proximity and explosive load limits will be determined.

Survivability and security analyses will be expanded in FY 1980 to consider the Ground-Launched Cruise Missile. Additionally, the development of survivable basing concepts for delivery systems will be continued.

New initiatives will be undertaken as a result of analyses and current work, especially quick, relatively inexpensive means to enhance near-term survivability and security.

C. LAND WARFARE

1. Introduction

Land Warfare encompasses those conventional weapons used by, and in direct support of, the ground forces of the Army and Marine Corps. The area of major emphasis by U.S. and NATO allies is to maintain balance with Warsaw Pact countries in order to offset their greater quantity and growing quality. The following subsections describe mission area objectives, highlight major programs and other significant efforts in land warfare.

2. Close Combat

a. Strategy

The major goal in Close Combat is acquisition of significantly improved weapons for armored and infantry units for use in direct engagements with the enemy. We must develop a combined arms force capable of successfully engaging a numerically superior armored force. We accomplish this by overcoming their larger forces with our higher quality weapons that have greater accuracy, greater lethality, and better protection than those of our potential adversary. However, we must not allow our drive for higher quality in our weapons to increase our costs to the point where we create an even worse quantity ratio. Our intent is to find the most cost and performance effective mix of tanks, infantry fighting vehicles, antitank missiles, antitank rockets and guns that we can afford in the necessary numbers to meet a presently numerically superior threat.

b. Key Programs

(1) XM1 Tank and Main Gun

Development and fielding of the XM1 tank as a modern, affordable replacement for obsolescent M48 and M60 tanks continues to be one of our highest priority Land Warfare development and acquisition objectives. To achieve the earliest possible fielding of the XM1, the program was planned from the start to include some concurrency of development and procurement. This approach does have the disadvantage of increased risk of delays if problems are encountered and not corrected prior to operational testing. However, concurrency has the potential to shorten the time to fielding by three years. Extensive testing has demonstrated capability of the XM1 to meet its firepower, survivability, and mobility goals but initial tests of the prototype tanks revealed deficiencies in reliability and durability. Modifications to correct these deficiences have been developed and an extensive test program is in progress to demonstrate a capability to meet the stringent reliability, maintainability and durability goals before high rate production begins. Results of this program to date show that mission reliability is now 299 mean-miles-between-failures (MMBF), exceeding the contract requirement of 272 MMBF at the current phase of the program by 10 percent. The first low rate production deliveries will begin in February 1980. We are requesting $51.3 million for RDT&E and $1032 million for procurement of 569 tanks in FY 1981, including $95.9 million for advance procurement. A request of $21.4 million is made for training equipment. The program to acquire and integrate the German 120mm smooth bore gun

system for future use on the XM1 tank is now progressing well, with a goal of first production delivery of the 120mm XM1 tank in August 1984. We are requesting $61.5 million for RDT&E and $3.9 million for procurement in FY 1981 for the gun, ammunition, and integration into the XM1. The IOC for the XM1 is July 1980.

(2) Fighting Vehicle (IFV/CFV)

The IFV/CFV will provide the mechanized infantry forces with an armored squad carrier that has significantly increased firepower, mobility, and protection compared to the present M-113. The IFV/CFV provides an effective companion vehicle for the XM1 tank, and significantly enhances projected anti-armor weapon to vehicle exchange ratios. The IFV will replace the M-113 armored personnel carrier in selected mechanized infantry units in the European theater. For operations in a nuclear, biological, chemical (NBC) environment, the IFV/CFV provides ventilated facepieces and protective clothing for the crew and individual masks and protective clothing for the remainder of the squad. The CFV version of the IFV will be issued to cavalry units for armored reconnaissance scout roles. Both vehicles will mount an automatic 25mm cannon and a tube launched, optically tracked, wire guided missile (TOW) weapon system. Procurement was initiated in FY 1980. FY 1981 funding is $464.4 million for procurement of 400 vehicles. The IFV/CFV program completed its operational test and evaluation in FY 1980. Concurrency of R&D and procurement is necessary in order to meet the May 1981 production as directed by Congress and to shorten the fielding schedule for this urgently required weapon system by at least 30

months. The IOC date for this program is October 1982. The FY 1981 R&D funding request is $42.0 million.

(3) Improved Light Antitank Weapons (VIPER)

The Improved Light Antitank Weapon (VIPER) is a low-cost (approximately $400 per unit), lightweight, short-range, shoulder-fired antitank weapon to replace the M72A2 LAW, which is comparatively deficient in range, accuracy, and lethality. Planned for use as a last-ditch defense against surging armor, VIPER is a high priority U.S. Army program. Development of the VIPER will be finished in FY 1981. FY 1981 funds request for R&D is $5.8 million and for procurement is $14.0 million for 13,000 VIPERS.

(4) Antitank Guided Missile (ATGM)

The tube launched, optically tracked, wire guided missile (TOW) is the main infantry antitank guided weapon of the U.S. Army. The growth in armor protection and ability of the threat Warsaw Pact tanks to work in obscurants has made it necessary to implement a significant product improvement program to retrofit existing TOW stocks. The improvements will be accomplished in two steps. The first will be an improved 5-inch warhead with improved penetration capability, and the second will be a 6-inch warhead version with the capability to operate in obscurants. Additionally, an antitank guided missile improvement program was launched in FY 1979. This effort is now oriented toward developing a manportable anti-armor/assault weapon (2 km range) in accordance with a tentative agreement for a cooperative program with our allies. FY 1981 R&D funding is $20.8 million for the TOW improvement and $21.2 million

for the future manportable anti-armor/assault weapon. The Army will also continue its evaluation of a ground launched Hellfire.

(5) YAH-64 Advanced Attack Helicopter (AAH)

The YAH-64 is a twin engine (1560 SHP T-700 engines) helicopter with four-bladed, fully articulated main and tail rotors, and three point gear with the pilot in the rear of a tandem cockpit. It is designed as a stable, manned aerial weapon vehicle optimized for destruction of armored vehicles but will defeat a wide range of targets and provide direct aerial fire as an element of the ground combat units. Armament systems are the Hellfire laser-seeking anti-armor missile system, 30mm automatic gun that will use improved ammunition similar to and interoperable with NATO ADEN and DEFA ammunition, and 2.75" rockets. The target acquisition and designation system (TADS) for employment of the weapon systems consists of an infrared imaging system for night operations, a direct view optics system, a TV system and a laser designator/range finder. A separate pilot's night vision system (PNVS) is included for night flight operations. Two prototype helicopters have been modified to incorporate configuration changes and to install fire control systems. Flight testing began in FY 1979 for evaluations of flying qualities, for armament and fire control system surveys, and initial Hellfire missile firings. Both prototype helicopters have successfully fired Hellfire missiles with ground designators and with autonomous designation. Three new YAH-64 aircraft are being fabricated. The first new AH-64 had a first flight in October 1979. In addition to this, an attack helicopter derivative of the UH-60A

is being investigated. The FY 1981 R&D request is $171.6 million.

(6) <u>Hellfire and Launch and Leave Hellfire</u>

In March 1976 the DSARC approved full-scale engineering development of the Hellfire Modular Missile for use on the AAH. Compared to the Cobra/TOW, Hellfire will significantly enhance the effectiveness and survivability of the AAH. The 7-inch Hellfire warhead will have a high level of effectiveness against present and near-term future types of armor. Because of its modular design, the basic Hellfire missile will be able to accept a variety of terminal homing seekers (laser, TV, Infrared (IR), Radio Frequency (RF), or dual mode RF/IR). Based on technical and cost considerations, a low-cost laser seeker has been selected for system qualification. For short-range and multiple missile launch conditions, the Army has judged this alternative seeker to be superior to the tri-Service laser seeker. Two guided missile flights have been conducted using this seeker. It functioned properly on both flights.

The first guided flight of a Hellfire from an Advanced Attack Helicopter (AAH) took place on 18 September 1979. To date there have been twenty-one guided missile firings. Initial production of laser Hellfire has been delayed about one year to be consistent with the AAH production schedule. Full scale development of an imaging infrared (IIR) seeker will start in FY 1981 to provide Hellfire with true "launch and leave" capability. The Army has been directed to pursue a parallel detector development approach. Designs of focal plane array detector technology as a prime effort,

and current generation detector technology as backup, will be evaluated. A final selection will be made in FY 1982. The Army and the Air Force have been directed to coordinate--with USDRE oversight management--respective IIR seeker developments to ensure maximum feasible commonality across Service programs. R&D funding of $54.6 million for a laser Hellfire and $24.9 million for an IIR seeker is requested for FY 1981. Procurement funding of $20.8 million is requested for laser Hellfire initial production facility setup and long lead item.

(7) High Mobility Multipurpose Wheeled Vehicle

This program will continue testing and evaluation of competitive highly mobile wheeled vehicles to replace the jeeps presently used to transport the TOW weapons systems in the light divisions, and perform a variety of combat support and combat service support roles. This system will replace the two jeeps and trailer presently needed to support one TOW system and provide a significantly greater degree of protection and mobility. It will be a workhorse for the airborne divisions and the rapid deployable forces. This is a multi-Service program and has the potential to introduce a number of derivative vehicles. R&D funding in FY 1981 is $2.8 million. The IOC date for this program is first quarter 1983.

3. Fire Support

a. Strategy

With the addition of TOW and Dragon, significant improvement is being made to the anti-armor capability of our

armored, mechanized, and infantry divisions. However, these systems will be subjected to heavy fire, since the attacker can focus his forces at points of his choice and the current distribution of antitank weapons within Army units will not provide sufficient anti-armor counterforce. To counter this possibility, the anti-armor capability of the close combat forces must be augmented by fire support arms and artillery, as well as close air support aircraft. These combinations can mass the bulk of their firepower in a timely manner at critical points along the front. U.S. technological superiority in precision guided weapons is being applied to provide our fire support arms with a significantly improved capability to attack Warsaw Pact armor.

b. Key Programs

(1) Copperhead

The Copperhead laser guided projectile will give artillery a significant anti-armor capability using existing Howitzers and personnel. The 155mm Copperhead entered full-scale engineering development in July 1975. Major changes to the advanced development design included wings to permit the projectile to fly under low cloud ceilings and to fly for extended ranges. Flight testing of the engineering development round began in March 1977. Engineering development was completed in October 1979. A DSARC III decision to enter limited rate production was rendered in December 1979. The IOC is scheduled for July 1981. For FY 1981, $6.0 million is requested in RDT&E and $121.0 million is requested for procurement of 4300 rounds.

(2) Multi-Launch Rocket System (MLRS)

MLRS will enhance our fire support capability for counterbattery and air defense suppression, especially during surge conditions and at longer ranges than current tube artillery. The system will have provisions for operating in a Nuclear, Biological, and Chemical (NBC) environment.

The initial MLRS payload will consist of submunitions optimized for the counterfire and air defense suppression missions. The Federal Republic of Germany (FRG) is pursuing a program for the development of a mine laying capability using the MLRS system and the FRG AT II Antitank Mine. Also, the U.S. is pursuing a program to develop a terminal guided warhead for the MLRS rocket.

MLRS is a joint development between the U.S., FRG, France, and United Kingdom (UK). A memorandum of understanding has been signed by four parties that describes the design, development, and production programs which satisfy tactical requirements of all four nations. The FY 1981 R&D request is $64.2 million and $92.7 million for procurement.

(3) Rocket Assisted Projectiles (RAP)

In response to the requirement to achieve greater range for the Army's 155mm and 8" Howitzers, a rocket assisted projectile (RAP) for each has been developed and is currently being procured. The 155mm High Explosive RAP round (M549) is a separately loaded projectile composed of two distinct components: the warhead (projectile) and Rocket Motor. This round can be fired from existing gun systems. The 8" High Explosive RAP round (M650) is

used with the M110A1/A2 self-propelled Howitzers and the M115 Towed Howitzer. In addition to these two rounds, the Army is developing an extended range 8" anti-radiation projectile (ARP). This round will use a radio frequency sensor to home on the electromagnetic signature of battlefield emitters, such as air defense and counter battery radars. $5.0 million RDTE is requested for FY 1981. The ARP program is currently in advanced development.

4. Ground Air Defense

a. Strategy

The Army in the field must have adequate air defense to ensure that the air threat does not destroy significant quantities of critical assets or seriously limit the maneuverability of friendly forces. A family of air defense weapons is required to counter the threat including: low-altitude, all-weather, short-range weapons for self- and point-defense; larger, more complex surface-to-air missiles systems for providing area coverage at medium and high altitudes; and manned interceptors/air superiority aircraft to defend the air space and to counter massed air attacks in a complementary role to the ground-based air defense systems. The air threat continues to increase at a rapid pace especially in terms of improved ground attack aircraft and weapons. This threat improvement represents a major Warsaw Pact shift in tactical employment of aircraft. We continue to improve fielded systems and have embarked on a major modernization program aimed at replacing or complementing all currently deployed systems.

b. Key Programs

(1) Medium/High Altitude Air Defense

(a) Patriot

The Patriot, a surface-to-air missile system, is planned to replace the Nike Hercules and Improved Hawk, providing greatly increased electronic counter-countermeasures (ECCM) and simultaneous engagement capability. A production contract award is planned for June 1980.

To date, a total of 51 guided flight tests have been conducted. During 1979, the Patriot test program conducted 18 firings. Fire units four and five were moved to White Sands Missile Range in preparation for DT/OT II. Effort on the initial production facility continued. The Rationalization, Standardization and Interoperability (RSI) effort to establish a NATO acquisition option proceeded to evaluate the European capacity to produce parts of the Patriot system. $51.6 million is requested for research and development (R&D) and $469.6 million for procurement in FY 1981. The IOC date is June 1982.

(b) Improved Hawk

While Patriot is planned eventually to replace Improved Hawk, there will be significant Hawk quantities in the inventory into the late 1980's. Missile procurement will be completed in FY 1980 with a final buy of 197 missiles. Product improvement efforts will center on procurement of the optical tracker and continued development and procurement of the missile electronic countermeasure (ECM) modifications. $7.4 million is requested for R&D in FY 1981.

(2) Short-Range Air Defense

(a) US Roland

US Roland is an all-weather, air defense missile system to supplement the fair-weather/daylight Chaparral system in the Corps and rear areas. This program is an example of the NATO Allies and US two-way street concept, and involves the transfer of a foreign design weapon system to the US for production. The design has been transferred and prototypes fabricated in the US for test and evaluation. A cooperative flight test program of 107 firings, 64 US and 43 European, was completed in April 1979. In preparation for FY 1979 procurement, the establishment of a production facility was initiated in June 1978. Low rate production was authorized in June 1979 and the first hardware contract was signed in October 1979 with the FY 1980 contract signed in January of 1980. The FY 1981 program funding requires $12.6 million for R&D, and $401.9 million for procurement.

(b) Division Air Defense Gun (DIVAD)

The Division Air Defense Gun development is designed to provide a ground-based air defense system capable of operating with the forward combat elements and providing protection from both fixed and rotary wing aircraft. The currently deployed Vulcan Gun is not capable of countering the threat and does not have the mobility or armor to operate effectively with armored or mechanized forces. The DIVAD Gun is being competitively developed by two contractors who are designing and building pre-production prototypes on an accelerated 29-month schedule. Following a shoot-off to

select a production model, the DIVAD Gun will enter a simultaneous maturation and production phase. The two systems under competitive development are pre-production prototypes built from mature, and in many cases, already tested subsystems, a fact which further enhances our confidence in the readiness for production. As an additional safeguard against premature commitment, a DSARC will be convened before entering the next phase of DIVAD acquisition. For FY 1981, $64.7 million is requested for RDT&E, $195.3 million for procurement of 12 systems and initial spares, and $9.1 million for ammunition procurement.

(c) Improved Chaparral

Chaparral is a fair weather, self-propelled, short range, passive, infrared homing air defense missile system which provides low altitude air defense to US Army divisions and the Corps rear area. The system was initially deployed in 1969 and is undergoing an upgrade program to enhance its ability to counter the increasing air defense threat for the next decade. FY 1981 R&D funds of $20.6 million provide for development of a modular, forward-looking infrared (FLIR) thermal imaging target detection device for a night firing capability and improved guidance section development. Procurement in FY 1981 is $45.9 million for FLIR modification kits, replacement rocket motors, minor reliability improvements and initial spares.

(d) Stinger

Stinger is a Man-portable Air Defense Missile System (MANPADS) which provides a self-defense capability to company-

size units operating in the forward battle area. Stinger counters enemy low altitude, high speed tactical aircraft and helicopter threats. Its ability to engage targets at any aspect angle in an infrared countermeasures environment overcomes the limitations of the currently fielded MANPADS, Redeye. Stinger is in production and $71.0 million is requested for FY 1981 procurement and $9.9 million for R&D of an advanced seeker.

5. Mine Warfare

a. Strategy

The major goal in Mine Warfare is development and acquisition of significantly improved antipersonnel and antitank mines. The mines developed must be cost effective and provide new capability to emplaced barriers to prevent enemy armor from advancing and to defeat that armor. All-weather, day and night scatterable mine capability is required to selectively and rapidly disperse mines by artillery, ground vehicles, and aircraft.

Scatterable mines are to be used to slow, direct or canalize enemy forces and improve the effectiveness of other weapons and tactics. Our objective in mine warfare is to find the most cost and performance effective mix of mines which presently exist and which are expected to emerge from development by the U.S., United Kingdom, Federal Republic of Germany, or France.

b. Key Program

Family of Scatterable Mines (FASCAM)

The U.S. will continue to pursue procurement of the ADAM and RAAM artillery-launched mines and vehicle dispensed GEMSS mines.

Development will be completed and Gator mines will be procured so that there will be an air-delivery capability for dispensing scatterable mines. The Army is pursuing development of a modular mine pack system for dispensing scatterable mines to support ground forces. A Memorandum of Understanding (MOU) among the U.S., United Kingdom, Federal Republic of Germany, and France was signed in July 1979 for a European development of a mine warhead, utilizing the German AT II mine for the Multi-Launch Rocket System (MLRS). The expected IOC date for FASCAM is July 1981.

6. Land Combat Support - Chemical Warfare and Chemical/Biological Defense

a. Strategy

The U.S. national policy on chemical warfare (CW) prohibits first-use of lethal or incapacitating chemicals, all uses of biological or toxin warfare, and limits defensive uses of herbicides and riot control agents. The principal policy objective is to negotiate a comprehensive, verifiable treaty to ban chemical warfare. The program objectives are to deter the use of chemical warfare against U.S. or allied forces by others and to maintain the capability to warn and protect U.S. forces and retaliate should deterrence fail. The thrusts, as developed in the Consolidated Guidance, are to improve the defensive posture of all forces to operate in a toxic environment and to maintain a credible retaliatory stockpile as an essential element of deterrence. Additionally, we should encourage our allies to improve their defensive capabilities. Reports to Congress each year for the last three years have provided

details of the status and plans to meet these objectives.

b. Key Programs

Our R&D programs are structured to address all deficient areas: a marginal defensive posture to survive and continue operations in a chemical environment; a deteriorating retaliatory stockpile; and an effective training program to utilize available protective equipment.

Both the science and technology and engineering development programs are directed toward procurement programs for new and improved defensive items. The key defensive programs in engineering development include an effort in accelerated decontamination equipment for individuals, equipment and large areas; continued development of the improved individual protective mask; completion of development for modular collective protection systems for TACFIRE, AN/TSQ-73, and Patriot; development of chemical training systems including airburst and ground simulator items; continuing development of the liquid agent detector paper, a chemical agent warning transmission system and biological detection and warning system. In advanced development are the hybrid collection protection system for armored vehicles, the automatic liquid agent alarm, a detector kit for chemical agents in water, a remote sensing chemical agent alarm, and a jet exhaust decontamination system. Product improvement measures are in progress on the M-51 shelter, the M-12A1 decontamination unit, the M-258 personal decontamination kit, and both the M-8 and M43-E1 chemical agent alarms. Of interest is the proposed procurement of the Federal Republic of Germany NBC marking set for U.S. field

use. Other procurement items include M-8 automatic point alarms, A/E23 D-3 automatic point detectors, overgarments, M-256 detector kits, modular collective protection items, M-51 shelters, decontamination apparatus, and tank filter units. RDT&E funding totals $54.9 million and procurement funds amount to $58.9 million.

7. Land Combat Service Support

a. Strategy

This mission area includes numerous small programs designed to provide responsive support to our operating forces. It includes tri-Service programs for development of a DoD standardized fully integrated system capability to provide enhanced interior and exterior physical security for DoD mission critical resources. The combat service support effort is intended to provide the land tactical commander with logistics, maintenance, energy, and medical support. Underlying the physical security equipment development programs are the objectives to provide a limited system capability for high priority, permanent installations by FY 1982, with a total system capability for permanent, semi-permanent, and mobile modes of deployment by FY 1987.

b. Key Programs

FY 1981 R&D funding for this area totals $80.7 million of which $51.3 million is for the DoD Physical Security Equipment programs. $46.4 million procurement is requested. Key programs include:

(1) Combat Support Equipment

This program encompasses combat engineer equipment

such as a family of bridging and container distribution equipment. It also includes logistics for over the shore missions, petroleum, oil and lubricant (POL) distribution systems, combat medical material, tactical rigid wall shelters, and Army development of camouflage, simulation and decoy systems which will be capable of defeating the surveillance threat of visual, thermal, radar and other sensors.

(2) Tactical Electric Power Source

This program will continue effort in advanced state-of-the-art power generation for field utilization. Benefits will be in mobility, noise, heat signature reduction, increased efficiency and reduced fuel consumption.

(3) Physical Security

The Army, as executive agency for interior physical security systems, is pursuing development of a DoD standardized interior system under the Facility Intrusion Detection System (FIDS) program. The Air Force, as executive agency for exterior systems, is developing a standardized exterior security system under the DoD Base and Installation Security System (BISS) program. Interoperability and the design of interfaces between these two systems are being accomplished by a Tri-Service Integration Working Group. Although a totally integrated interior-exterior system capability is not expected until FY 1986, products of both programs will be made available on an incremental basis to satisfy high priority applications as development is completed.

8. Tactical Surveillance, Reconnaissance and Target Acquisition

a. Strategy

Improvements in the quality and quantity of weapons and operational tactics have emphasized the need to detect, localize and classify enemy presence data and to provide large volumes of target data on a timely basis to support target engagements and friendly maneuvers. Tactical Surveillance, Reconnaissance and Target Acquisition Mission Area programs are structured to provide timely and accurate data to the battlefield commander engaged with the enemy. The data support effective utilization of combat resources on a 24-hour day basis and under adverse weather, countermeasure, and battlefield conditions.

These programs are coordinated to assure a comprehensive framework of complementary, interoperable and survivable assets, and to prevent redundancies.

Targeting data are time perishable in dynamic combat environments. Battlefield sensor systems will be interfaced with the Battlefield Exploitation and Target Acquisition (BETA) for near real-time fusion and dissemination of targeting data, and with an automated artillery command and control system for targeting of artillery assets. Interfaces between the Standoff Target Acquisition System (SOTAS) and Short Range Air Defense System (SHORADS) are being evaluated to provide SOTAS detection of low flying aircraft for cueing purposes to SHORADS.

b. Key Programs

Major programs in the battlefield surveillance mission area are described below:

(1) Stand-Off Target Acquisition System (SOTAS)

SOTAS is an Army program to develop an airborne target acquisition system that will provide a new capability to detect and locate moving targets, during day and night, and under most weather conditions. Information will be displayed in near real-time at ground stations with sufficient accuracy for strike by Army ground and Air Force support weapon systems.

SOTAS is a division-level asset consisting of helicopter-borne radars; one primary ground station at the division tactical operations center (DTOC); one or more secondary ground stations (division artillery - one; alternative DTOC - one; three-brigade headquarters - one each); and a data link/positioning system. One helicopter can cover the division's area of interest; four helicopters per division allow continuous coverage during periods of sustained combat. The targeting data from SOTAS will also be fed to the BETA fusion center and combined with Guardrail V, Firefinder, UPD-4, Rivet Joint, Compass Ears, TEREC, and the Navy's EP-3E data. The SOTAS program was approved for engineering development by the DSARC in August 1978. The FY 1981 R&D program is funded at $55.1 million.

(2) REMBASS

REMBASS consists of sensors utilizing magnetic, seismic, acoustic, infrared and pressure phenomena that may be hand emplaced, delivered by aircraft or by artillery, data links to transmit sensor data to monitor stations, repeaters to automatically relay data link information where line-of-sight is not feasible,

hand-held monitoring sets and a suitcase size monitoring set. Records of sensor reports in time-ordered sequence will be made for analysis and estimates of target location, speed, direction of travel, convoy size, and classification as to tracked, wheeled, or personnel.

The REMBASS data link will be compatible with the Remote Area Weather Station (RAWS) system and the Base Installation Security System (BISS).

REMBASS is in the third year of a four-year development program. The FY 1981 R&D funding request is $4.0 million. An IOC of third quarter 1983 is projected for REMBASS.

(3) Remotely Piloted Vehicle (RPV)

The development of an RPV system for target acquisition, adjustment of artillery fire, laser target designation, and reconnaissance is a high priority program. This system will extend the eyes of brigade and divisional units beyond the first hill, and allow division artillery units to place effective fire on targets which cannot be seen by ground observers. When used with precision guided munitions, targets such as tanks can be attacked as they move towards the battle area.

The initial sensor package will consist of a gimballed Tv and laser ranger/designator for daylight operations. An interchangeable sensor package with FLIR for night operations is in advanced development.

A contract was awarded on 31 August 1979 for the Full-Scale Engineering Development and Acquisition of an RPV system.

Contract value is $101.1 million over a period of 43 months. Hardware delivered will consist of 22 air vehicles, 19 mission payload subsystems, 4 ground control stations, and 3 launcher and recovery subsystems. First flight of the system is scheduled for August 1981.

D. AIR WARFARE

1. Introduction

Air Warfare covers the mission areas of Counter Air, Close Air Support/Battlefield Interdiction, Interdiction/Naval Strike, Defense Suppression, and Air Warfare Support. The primary goal of our Air Warfare programs is to increase the effectiveness of our tactical air forces in countering Warsaw Pact forces, in defending our naval forces and in projecting sea-based air power ashore.

2. Counter Air

a. Strategy

Historically, U.S. and NATO fighter aircraft have had a technological edge on Russian and Warsaw Pact aircraft. However, in recent years the Soviets introduced significantly improved aircraft and at the same time have maintained their numerical superiority. Therefore, we must utilize our technological superiority to achieve high effectiveness and greater availability in our aircraft and move toward higher effectiveness at moderate cost in our weapons. Lookdown/shootdown capability is required, and efforts are continuing to improve both our aircraft and missiles in this regard. A capability to effectively close enemy airfields is an important means to reduce the number of enemy sorties, and we are developing and testing ordnance specially designed for this task.

b. Key Programs

Some major program highlights are as follows:

(1) F-16 Multimission Fighter

The F-16 is being developed as a replacement fighter

aircraft for the U.S. and four NATO nations. The F-16 is a lightweight, high performance fighter capable of performing a broad spectrum of tactical air warfare tasks at an affordable cost. It will replace aging F-4 aircraft in the active inventory and some of the older aircraft in the Reserve Forces.

The first deliveries to USAF and European Tactical Air Forces and to a USAF training squadron occurred during 1979. The F-16 will be the first USAF aircraft to employ the Advanced Medium Range Air-to-Air Missile (AMRAAM). The aircraft production rate is currently 10 per month. We anticipate fabrication and component assembly to reach 15 per month by the end of FY 1980 and to continue at our planned aircraft fabrication goal of 15 per month in 1981. The FY 1981 funding request includes $42.3 million in development and $1,877.3 million for procurement.

(2) F-15 Fighter

The F-15 is designed specifically to gain and maintain air superiority. It is a high performance, highly maneuverable fighter equipped with a long-range lookdown radar and a balanced mix of air-to-air weapons (AIM-7, AIM-9, 20mm). It will use AMRAAM when available. The force will include F-15C and D models which will incorporate a programmable signal processor (PSP) and other improvements. $9.1 million is requested in the FY 1981 budget for on-going program management and support along with procurement of 30 aircraft at a cost of $860.6 million.

(3) Engine Model Derivative

Congress directed that $41 million be used to fund

a joint Air Force/Navy program for competitive development of an engine which could be used in the F-14, F-16, or other aircraft to obtain greater durability than is being achieved with the current engines. The resulting program consists of limited development and flight demonstration of the F-101X engine while continuing improvements to the TF-30 (F-14) and F-100 (F-15 & F-16) engines. During FY 1981, the second 1,000-hour accelerated mission test will be completed on the F-101X, the engine will be cleared for flight and testing on F-16 and F-14 aircraft will be accomplished. $48.6 million is requested in the FY 1981 budget in the Air Force Engine Model Derivative program to continue this effort.

(4) Beyond Visual Range (BVR) Missiles

Our current BVR air-to-air missiles are AIM-7 Sparrow and AIM-54 Phoenix. The Phoenix is a long range missile optimized for fleet air defense. The Navy's F-14 with AWG-9 fire control system can launch multiple Phoenix missiles at multiple targets. The AIM-54A should fulfill this need for several years until the Soviet Union develops more effective electronic countermeasures (ECM). The AIM-54C, now being developed, should meet the projected ECM threat during the 1980-1990 time period. The AIM-54C will replace analog circuitry with modern digital processing. The AWG-9 will be upgraded with a programmable signal processor.

The medium range AIM-7M Sparrow is now in development. Using a monopulse seeker, it provides better performance than the AIM-7F.AIM-7M production will begin in in FY 1980 with all production shifting to AIM-7M in FY 1981.

In the AMRAAM program we are taking advantage of advanced technology to develop a follow-on radar missile to provide a high engagement rate against multiple targets, improved range, lower susceptibility to ECM, lighter weight and higher speed than AIM-7s. Two contractors are now in a competitive validation phase.

Development of AMRAAM and an Advanced Short Range Air-to-Air Missile (ASRAAM) is intended to be a cooperative NATO program. A Memorandum of Understanding is being negotiated with the Federal Republic of Germany, France, and the United Kingdom. This provides that the U.S. will develop AMRAAM, and our European Allies will develop ASRAAM. The required system characteristics for both systems have been agreed to in principle, by the Four Powers. This "family of weapons" concept of development is intended to take advantage of the best technology throughout NATO and to share development costs on each side of the Atlantic. Total funding requested for BVR missiles for FY 1981 is \$79.2 million R&D and \$298.3 million for procurement.

(5) Within Visual Range (WVR) Missiles

The ASRAAM program is in its very earliest stages and the missile is not likely to be in our forces until the 1990s. In the meantime, we are producing the AIM-9L Sidewinder. This WVR missile uses a sensitive infrared seeker that permits attack of military power targets from all aspects. The AIMVAL/ACEVAL tests showed us that having all aspect capability causes drastic changes in the nature of WVR air combat, but it also showed that the highly sensitive AIM-9L will lock onto background objects or the horizon in some situations. To correct this deficiency, we are continuing engineering development of a

modified seeker that will enhance background discrimination capability. We plan to introduce the resulting AIM-9M in FY 1982, and have included \$2.5 million for development in FY 1981. No funds are requested for ASRAAM. We are requesting \$85.7 million for procurement of the Sidewinder.

(6) Low Altitude Airfield Attack System (LAAAS)

We have a joint U.S./UK engineering development program for the JP-233 LAAAS. The objective of this program is to reduce enemy aircraft sorties by cratering runways and slowing their repair. The system is designed for delivery by the UK Tornado and the U.S. F-111E. Full scale development started in November 1977. Prototype submunitions have been tested and dispenser flight trials have begun on the UK Buccaneer test aircraft. Since submission of last year's budget, the RDT&E cost estimate has risen to \$219 million in then-year dollars from the \$195 million in the FY 1980 President's Budget. The procurement cost estimate has risen to \$2.9 billion from \$1.5 billion. Ninety percent of the cost increase is caused by changes in the UK inflation rate and fluctuations in the pound/dollar exchange rate. The Air Force is looking at ways to reduce the cost of the JP-233 program. The FY 1981 request for JP-233 is \$56.0 million to continue engineering development and testing.

3. Close Air Support/Battlefield Interdiction

a. Strategy

Close Air Support and Battlefield Interdiction is particularly important because of the Soviet/Warsaw Pact capability to achieve locally overwhelming force ratios. Fixed wing aircraft

provide a highly flexible force, effectively a firepower reserve, that can reach all parts of the theater to draw down enemy forces at or near the front lines. The Soviet Union has placed great emphasis on the ability to move forces quickly and to move and fight at night. To counter this threat, we are improving our capabilities for night and adverse weather operation and are developing means to increase the rate at which we can destroy enemy forces.

b. Key Programs

(1) A-10 Squadrons

In January 1979, the first of six planned combat ready squadrons arrived at RAF Bentwaters-Woodbridge in the United Kingdom. In July, two Air National Guard squadrons converted from F-100 fighters to A-10. A third Guard squadron converted from A-37s to the A-10 in December.

Testing was resumed on the fatigue test article in January after defining a new test spectrum based on actual usage of the A-10. Previous testing provides 4500 hours of equivalent operational usage by the new, tougher design spectrum. The testing now has an objective of demonstrating 6,000-hour life with a goal of continuing toward an 8,000-hour point.

The FY 1981 request includes $13.6 million for RDT&E continuation and $493.2 million for procurement of 60 aircraft.

(2) Night Attack Program

The Night Attack program has explored sensor and display technology to permit aircrews to do navigation, target acquisition, and weapon delivery at low altitude at night. Several tech-

nologies have now developed to the point where a highly effective night attack capability for single seat aircraft can be provided. The Night Attack program will develop the concept of Low Altitude Navigation and Targeting Infrared Night System (LANTIRN) and evaluate the risk in an early brassboard demonstration. RDT&E request for $74.8 million will principally support a competitive procurement of the brassboard demonstrator. $19.5 million of these funds will continue efforts in terrain following radar, fire control technology and a target acquisition and designation competitive procurement.

(3) Close Air Support Weapon System

Maverick is an air-to-surface missile designed to destroy enemy armor or other small, hard tactical targets. Maverick has developed a family of guidance seekers. A television guided weapon is already deployed with the tactical air forces. An imaging infrared (IIR) seeker for Maverick started full scale development in October 1978 for the Air Force. Helicopter captive flight tests have been conducted for alternative IIR seeker algorithms. These provide even better lock-on tenacity than the digital centroid tracker tested in Europe during early CY 1978. To assure thorough testing prior to a production decision, budgeting of initial procurement funds was deferred to FY 1982. The Navy has chosen a slightly modified IIR Maverick to fill its at-sea IR attack weapon requirement, in lieu of a new weapon development. The Navy and the Air Force are finalizing a management plan for acquisition of this variant. The Air Force has no present plans for a laser guided Maverick, but the Marine Corps is interested and will complete a limited operational evaluation in FY

1981. Total funding requested for the Maverick program in FY 1981 is $40.3 million for engineering development.

(4) Assault Breaker

Assault Breaker is a joint DARPA, Army, Air Force feasibility demonstration program. The system employs surface-to-surface and air-to-surface missiles targeted and guided by an airborne radar. The feasibility demonstration phase is scheduled to be completed toward the end of FY 1981. After the system concept is demonstrated, the Army and Air Force will conduct engineering development of a weapon system. Progress to date includes captive flight testing and selection of a terminally guided submunition sensor and dispenser design for the free flight phase. We are requesting $6.6 million in FY 1981 for the Army to perform program planning and to support entry into full-scale development. We are also requesting $7.1 million in FY 1981 to conduct a feasibility demonstration of the air launched Assault Breaker and to perform program planning necessary for the engineering development phase.

(5) Advanced Attack Weapons

We have begun the development of a family of area munitions, dispensers, warheads and guidance systems in the Advanced Attack Weapons program. The Wide Area Anti-Armor Munitions (WAAM) program will provide a system capable of multiple kills of armor targets per aircraft pass, even at night and in adverse weather. The MENS was approved in September 1979. The four munitions concepts originally in development have been reduced to three: the Anti-Armor Cluster Munitions (ACM), the Extended Range Anti-Tank Mine (ERAM), and the

Wasp Mini-Missile. An ACM full scale development decision is planned for the second quarter of FY 1980. ERAM and Wasp are in advanced development. The Army and the Air Force will coordinate Wasp and Hellfire (described in the Land Warfare section) developments to determine the opportunities to utilize common systems or subsystems to meet both Air Force and Army anti-armor requirements. An Executive Committee, chaired by USDR&E, has been formed to assure strong central management of DoD's terminally guided submunition (TGSM) programs. These programs include WAAM, Assault Breaker and the TGSMs being developed for possible use in the multiple launch rocket system. The committee reviews these programs to improve management efficiency, eliminate unwarranted duplication, and insure that an appropriate degree of competition is maintained. Funding requested in FY 1981 for WAAM advanced development and testing is $24.6 million. Engineering development funding for ACM is $20.3 million.

4. Interdiction/Naval Strike

a. Strategy

Many land and naval targets will be defended by long range missiles or aircraft. This presents a need for precision standoff weapons.

b. Key Programs

(1) TLAM-C

We are pressing ahead with full scale engineering development of the Tomahawk conventionally armed land attack missile. The high accuracy demonstrated thus far makes a conventional munitions warhead attractive against fixed land targets. Operational

objectives for this variant, which will be deployed on nuclear attack submarines and surface combatants, are to provide naval forces with a long range cruise missile capability to attack and neutralize enemy facilities and degrade base defense capabilities with conventional munitions.

(2) Air-to-Ground Standoff Weapon

The air-to-ground standoff weapon program is more commonly known as the Medium Range Air-to-Surface Missile (MRASM) program. The goal is to provide the Navy and Air Force with a reasonable cost, survivable weapon with which to attack high value, land and sea targets. The Navy and the Air Force are developing joint requirements and a MENS is being prepared for this standoff mission requirement. We recognize an urgent need for our Navy and Air Force to be able to minimize aircraft attrition through standoff attack of key heavily defended targets. The Navy has selected a variant of the Tactical Air Launched Cruise Missile (TALCM) with various guidance modules--radar, imaging infrared--as a near term solution that can be available for a production decision by December 1984. The FY 1981 funding request for development of a joint MRASM is $22.7 million.

(3) GBU-15 Glide Bomb

The GBU-15 project was established to provide a capability to conduct effective attacks against high value fixed land targets. Progress to date includes development of a cruciform wing glide weapon for low altitude attack, a planar wing kit to increase range and a guided cluster munitions warhead. The Air Force integrated and tested the Naval Avionics Command weapon data link on the Cruciform

Wing Weapon (CWW). Congressionally directed testing of the CWW-TV-Data Link Weapon began in December 1979. After these tests, we will decide whether to seek Congressional approval to reprogram remaining FY 1979 RDT&E funds to initiate production. Integration of the Maverick imaging infrared seeker into the CWW is under way. The Air Force is also funding their share of the hardened joint Service Weapon Data Link (JSWDL) under this program. These efforts will provide the GBU-15 CWW with night and adverse weather attack capability with much less susceptibility to threat electronic countermeasures. RDT&E funding requested in FY 1981 for GBU-15 CWW-IIR-Data Link development is $37.2 million. We are also requesting $31 million in FY 1981 for GBU-15 CWW-TV-Data Link production.

(4) F/A-18 Naval Strike Fighter

The F/A-18 is a twin engine, single-seat, multi-mission tactical aircraft which will replace the F-4 in the Navy and Marine Corps fighter community and the A-7 in the Navy attack forces. In the fighter role, its primary mission is fighter escort with a secondary mission of fleet air defense where it will complement the F-14 aircraft. It will carry a balanced mix of AIM-7s (AMRAAM when developed), AIM-9s and a 20mm gun. In the attack role, it will be capable of accurately delivering all guided and unguided air-to-surface weapons.

Full scale development is proceeding somewhat behind schedule. Successful initial sea trials were accomplished in November 1979. DSARC IIIA is planned for the March/April 1980 time frame with an IOC planned for March 1983. The FY 1981 budget request

for development is $128.3 million and $1,399.0 million for procurement of 48 aircraft.

5. Defense Suppression

a. Strategy

The primary threat to aircraft engaged in tactical air operations is an integrated network of sea and land-based, radar-directed air defense artillery (ADA), surface-to-air missiles (SAMs) and interceptors. The Warsaw Pact has numerous types of highly mobile, widely distributed and overlapping SAM systems. They operate in close cooperation with early warning radars and threaten the survival and reduce the effectiveness of our tactical air forces. At sea, tactical operations face similar ship-based, radar-controlled air defense systems, which may be grouped in supportive formations and integrated with land-based elements. To achieve an effective defense suppression, we are pursuing an aggressive program *leading* to an appropriate mix of lethal and non-lethal systems.

b. Key Programs

(1) High Speed Anti-Radiation Missile (HARM)

HARM is an air-launched guided missile which can suppress or destroy the radars of enemy surface-to-air missile systems and air defense artillery. HARM is able to attack radars which are beyond the capability of either SHRIKE or Standard Anti-Radiation Missiles. It is a joint U.S. Navy/Air Force program intended to be used with the A-7, F/A-18, and F-4G Wild Weasel aircraft. The program has incorporated improvements in airframe maneuverability and frequency coverage. Development testing is in progress; all firings to date have been

successful. For technical and budgetary reasons, the planned procurement of 80 pilot production missiles for early Navy IOC was delayed. The first procurement for Air Force missiles is now planned for FY 1982. We are requesting $60.1 million for RDT&E and $100.4 million for procurement.

(2) Electronic Countermeasures Pods

Production of the ALQ-131 pod is continuing. Major gains in reliability and maintainability have been achieved. We are developing a modification to increase the effectiveness of the pod against threat systems.

6. Air Warfare Trainer Aircraft

a. Strategy

Both the Air Force and Navy will experience deficiencies in trainer aircraft unless steps are taken soon to provide for their future needs. The Services are working together to define their needs so that both the primary trainer (first needed by the Air Force) and the advanced trainer (first needed by the Navy) can ultimately be used by both Services.

b. Key Programs

(1) Naval Undergraduate Jet Flight Training System (VTXTS)

The VTXTS will replace the Navy advanced pilot training aircraft which are becoming obsolescent. The system will consist of actual flight, simulated flight, and academics. The MENS was approved in June 1979. Detailed studies, with industry participation, will investigate new systems and off-the-shelf alternatives in preparation for DSARC I in late 1981. Funding of $5.1 million for

development is requested.

(2) <u>Air Force Next Generation Trainer (NGT)</u>

The T-37 primary flight trainer, which is approaching the end of its service will be modified or replaced. The replacement will be a two-seat (side-by-side) aircraft with modern wing technology and turbo-fan engines to provide a training aircraft with the greatest practical fuel economy. In-house studies are under way, and proposals will be requested early in 1980. We are requesting $1.9 million in FY 1981 to continue the evaluation efforts.

E. NAVAL WARFARE

1. Introduction

Naval Warfare programs are oriented toward maintenance and improvement of capabilities essential to free use of the seas. Principal needs in Naval Warfare are to:

- o Protect the sea lines of communication linking us to the territory of allies threatened by external aggression.
- o Protect merchant ships carrying US foreign trade and support our allies in protecting their own trade.
- o Protect our own territory and to assist our allies in protecting their territory from attack by hostile maritime forces.
- o Protect our maritime strategic deterrent forces.

Naval Warfare forces include not only those which defend shipping against direct threats, but those sea-based air and amphibious assault forces which can strike at threats before they can reach the sea lanes.

2. Anti-Air Warfare (AAW)

a. Strategy

Defense of the surface fleet against air attack is based upon the defense-in-depth concept. Under this concept, the attacking aircraft and anti-ship missiles will first be engaged at longer ranges by fighter aircraft and long-range area defense SAMs. These weapons systems will reduce the number of attackers to a level which can be countered successfully by the ship's shorter range self-defense systems. Current programs in this area are supported by approximately $250 million in R&D and $1.3 billion in procurement. They are directed

primarily toward improving the range and effectiveness of shipboard combat systems and providing more integrated ship AAW systems for the future fleet.

b. Key Programs

(1) Aegis and CSEDS

Aegis is an integrated AAW system designed for fast reaction, high tracking and engagement capacity, and improved missile guidance. Design modifications for the Aegis system, based on our experience gained from the sea trials, will be tested at the land-based Combat Systems Engineering Development Site (CSEDS). The initial installation of Aegis will be on CG-47 in 1981 with 16 systems currently planned for procurement in the 1981-1985 time frame. For FY 1981, RDT&E funding of $19.4 million supports Aegis developmental testing on the NORTON SOUND and $30.0 million is for the integration and testing of the ship's tactical computer at the CSED site. Procurement funding of $836.0 million is requested in FY 1981 for the third and fourth ships of the CG-47 class Aegis cruisers (formerly designated DDG-47 destroyers).

(2) Standard Missiles

An improved propulsion system will be incorporated into the Standard Missile (SM-1). A follow-on missile, the SM-2, will incorporate many additional features to increase the weapon system effectiveness. Aegis equipped ships will use the SM-2 missile. The IOC of the SM-2 will be 1980. The New Threat Upgrade program, to give the CG 36/38, CG 16/26, and DDG-37 classes of ships the capability to fire the SM-2 (extended range) missiles, has recently been completed. Current plans call for upgrading all these ships by 1991, but an

accelerated program is proposed to complete the upgrade by 1988. The VLS system, for the vertical launching of the Standard Missile, is in development and is planned for the CG-47 class ships starting in FY 1982. VLS promises to reduce costs, decrease reaction time and increase the number of platforms on which the Standard Missiles could be installed. In FY 1981, funding requested is $90 million in RDT&E to improve and test the SM-2 missile, produce the SM-1 missile modifications for operational evaluation, and develop a vertical launcher; and $265.7 million in procurement to buy 260 SM-1 (medium range), 70 SM-2 (medium range), and 275 SM-2 (extended range) missiles.

(3) Self-Defense Weapon Systems

The short range air defense requirements for surface ships will be met by the Phalanx (Close-In Weapon System) gun system and the Improved Point Defense (IPD) missile system. Both systems entered the fleet operationally in 1979. Phalanx is a high-rate-of-fire 20 mm gun with a self-contained closed-loop search and track radar mounted in a single above-deck structure. The improved Point Defense system uses the NATO Sea Sparrow missile. The Phalanx systems will be installed on the FFG-7, CG-47, DD-963, and certain CGN Class ships as well as selected auxiliaries. In FY 1981, funding of $3.1 million is requested for RDT&E and $151.2 million in weapons procurement and spares to buy 62 Phalanx units.

A cooperative effort with the Federal Republic of Germany and Denmark is underway to develop the Rolling Airframe Missile (RAM), a lightweight, low cost, ship defense missile system as either a stand alone point defense system or as a complement to NATO Sea Sparrow.

In FY 1980, $19.1 million was funded for the US portion of the engineering development costs. In FY 1981, $1.5 million has been provided to continue this effort. The initial fleet availability date is FY 1988.

(4) Self-Defense Electronic Warfare

As a complement to hard-kill AAW weapons, in the future, the fleet will place increasing emphasis on "soft-kill" or electronic warfare (EW) means to decoy or confuse enemy missiles. Crosseye, an active EW system, will continue to be emphasized. A high-angle threat capability will be developed for the SLQ-17/32 shipboard EW suites. In FY 1981, efforts will continue to develop off-board microwave and infrared decoys and new chaff dispensing systems. In FY 1981, a total of $5.9 million is requested in RDT&E and $1.0 million in procurement.

(5) Shipboard Surveillance Radars

Improvement of the shipboard radars in support of Fleet Air Defense will continue in two broad areas--upgrading near term fleet radar capability and developing future radars. Improvements to existing radars will emphasize automatic target detection and tracking techniques plus reliability and maintainability. The efforts being pursued under the Shipboard Surveillance Radar Systems (SSURADS) program, which address the new radar needs for the fleet in heavy threat environment postulated for the 1990s, have been incorporated under the DDGX Combat Suite program commencing in FY 1981. This program will support the development of advanced radars as part of an integrated combat system which can operate effectively against multiple targets

in a heavy electronic countermeasure environment. In FY 1981, the DDGX Combat System effort will receive its first year R&D funding of $30 million.

(6) Command and Control

The defense-in-depth concept requires effective coordination of sensors and weapons on both ship and air platforms. Electronic jamming of communication links, as well as surveillance and fire control radars, are expected to pose a significant threat to the effectiveness of our AAW systems. The Navy is participating with the other Services in developing the requisite systems to counter this threat. The Joint Tactical Information Distribution System (JTIDS) is expected to provide for more secure communications. These developments are discussed in the section on Theater and Tactical C^3I. Efforts to improve the electronic countermeasures resistance of our shipboard and airborne radars are continuing.

(7) F-14 Fleet Air Defense Fighter

The F-14 is the primary air defense fighter armed with the AIM-54 Phoenix long range air-to-air missile. It will also carry the AIM-7 medium range missile (or AMRAAM, when developed) along with the AIM-9 missile and 20 mm gun for short range engagements. Development of a digital programmable signal processor for the radar will improve F-14 performance by allowing more rapid response to electronic countermeasure threats, short range medium PRF (pulse repetition frequency) capabilities, and allowing expanded and more accurate AIM-54 missile envelopes. The updated AWG-9 will have the capability to accept the software for noncooperative target recognition techniques

and to allow further weapon system evaluation through software modification only. Limited development of the F-101X engine for possible use in the F-14, should the TF-30 component improvement program fail, is also being pursued. The FY 1981 budget requests include $31.7 million for procurement of 24 aircraft.

3. Ocean Surveillance and Anti-Surface Ship Warfare (ASUW)

a. Strategy

The goal of Ocean Surveillance and Targeting programs is to provide timely and accurate surveillance data to naval tactical commanders and the National Command Authorities in a form suitable for tactical exploitation. The fleet has shown an inherent capability to target Harpoon with a high probability of acquisition, largely on the basis of shipborne sensor information. In structured exercises, the fleet has demonstrated the capability to use support aircraft and remote sensors to target Tomahawk to 300 n.mi. The degree of success in employing Tomahawk is highly dependent on the background shipping density. Work is continuing to improve our capability for targeting. Anti-Surface Warfare uses the surveillance and targeting information to destroy or neutralize detected targets, whether they are enemy surface combatants or merchant ships. Tomahawk development is the major effort in FY 1981.

b. Key Programs

(1) Over-The-Horizon (OTH) Targeting

Initial demonstrations have focused on the use of the Outlaw Shark system to provide correlated, computer-formatted,

all-source surveillance information to the forces at sea. Outlaw Shark data are then correlated with on-board sensor data to support target identification and targeting requirements. The long range plan is to integrate an Outlaw Shark-like capability into existing shipboard hardware, starting with the MK-117 Fire Control System aboard nuclear attack submarines. In FY 1981 all OTH efforts will be centrally managed within the Navy's command and control structure. Funding of $19.2 million in RDT&E and $5.6 million in procurement is requested to support the basic development effort which will result in the introduction of an over-the-horizon targeting capability in support of Tomahawk.

(2) Anti-Ship Tomahawk Cruise Missile

The anti-ship variant of the Tomahawk is a 300 n.mi. offensive weapon capable of deployment from submarines and surface ships. Primary emphasis during FY 1981 will be on system testing to validate performance in order to achieve the dates specified above. In FY 1981, $130.2 million in RDT&E is requested to complete ship launch technical evaluation for both the land attack and ship attack versions and to complete submarine launched operational evaluation. The procurement of anti-ship missiles as well as conventionally armed land-attack missiles has been accelerated by the Congress' addition of FY 1980 procurement funds. In FY 1981, $103.3 million is requested for procurement of 16 anti-ship and 4 land attack missiles.

(3) Penguin

Penguin is a Norwegian, inertially guided passive infrared terminal homing, 16 n.mi. anti-shipping missile. The U.S. is conducting a joint evaluation of the MK-2 Penguin with the Royal Norwegian Navy. The MK-2 includes an improved seeker and a dog-leg trajectory capability. In FY 1981, $6.7 million is requested to continue the joint test and evaluation program begun in FY 1980.

(4) Surface Gunnery

Work in this area will continue on the 5-inch guided projectile program and with improved sensors to support surface gunnery. In FY 1981, RDT&E funding of $30.7 million is requested for the fabrication, testing and integration of 5-inch guided projectiles and $16.8 million for engineering development models of the Seafire electro-optic fire control system. Also in FY 1981, $34.5 million is requested to procure 5"/54 and 76 mm ammunition.

4. Undersea Surveillance and Anti-Submarine Warfare (ASW)

a. Strategy

Undersea surveillance provides information on the types and locations of potentially hostile submarines, early warning of surge deployments of hostile submarines, and technical information on Soviet submarines. Anti-Submarine Warfare (ASW) protects the U.S. forces so that they can perform their missions and assures that sea transport suffers minimal losses from submarine attack.

Surveillance developments in FY 1981 will continue to emphasize rapid detection and localization of threats for tactical

ASW commanders through the implementation of an Integrated Undersea Surveillance System (IUSS).

ASW efforts during FY 1981 will continue to be directed toward development of in-depth area, barrier, and local defense capabilities that will complement our undersea surveillance and command and control systems. The FY 1981 effort in the phased sonobuoy development program is scheduled to place the Phase I Vertical Line Array DIFAR buoy into production, and the Expendable Reliable Acoustic Path Sonobuoy into engineering development tests. The P-3 modernization and S-3 weapons systems improvement programs, which will provide the platform communications and processing capability to work with the buoys in area, barrier, and carrier task force operations, were defined in detail in FY 1979 and will be well into integration in FY 1981. R&D for the P-3 acoustic and non-acoustic localization upgrades will be completed in FY 1981, while the remaining improvements will be undergoing operational evaluation. Studies are on-going to identify the next generation patrol craft and attack submarine. In local ASW, the extended-range helicopters (LAMPS MK III) will enter operational evaluation, and the AN/SQR-19 Tactical Towed Array Sonar system will complete integration.

b. Key Programs

(1) Surveillance Towed Array Sensor System (SURTASS)

Solutions to array reliability and shore-based software problems were successfully tested in a series of at-sea tests leading to a formal technical evaluation (TECHEVAL) starting in October

1979. For FY 1981, funding of $5.2 million is requested to continue product improvement, correct T&E deficiencies, and conduct operational tests in different operating areas. In procurement, $8.1 million is requested to buy three follow-on shore processing modules, and $177.1 million is requested for five tow ships and their arrays.

(2) Tactical Towed Array Sonar (TACTAS)

The AN/SQR-19 development effort was restructured in FY 1979 and contract negotiations were completed in August 1979. In FY 1980 effort will be focused on system development and at-sea brassboard tests with the objective of supporting a FY 1981 installation of the full-scale development test system. In FY 1981, funding of $28.7 million in RDT&E is requested to complete software validation tests, to complete array and electronics in-plant tests and system integration, to install the engineering development model on the test ship, and to continue improvements for the SQR-18 TACTAS.

(3) LAMPS MK III

The first helicopter was rolled off in late FY 1979 and the flight tests were conducted successfully on schedule in December 1979. FY 1980 will bring commencement of system evaluation and field development tests and the first installations of ship systems. DSARC IIIA for consideration of pilot production is anticipated in late FY 1981. For FY 1981 $100 million in RDT&E is requested for developmental and operational test and evaluation. We are also requesting $120 million for long lead-time production.

(4) MK 48 Advanced Capability (ADCAP)

In order to effectively counter the threat projected for the 1980s and beyond, the MK 48 will be given improved acoustic performance, better counter-countermeasures effectiveness, increased warhead stand-off distance, and a close-in attack capability. FY 1981 funding of $57.8 million in RDT&E is requested to go into contract to test torpedo alteration kits.

(5) Advanced Lightweight Torpedo (ALWT)

The ALWT is an air and surface launched weapon that will replace the MK 46 NEARTIP. The ALWT will operate against a deeper, faster, possibly quieter submarine threat employing sophisticated countermeasures. In FY 1981, $74.3 million in RDT&E is requested for two contractors to complete fabrication of advanced development models and initiate in-water testing.

(6) Long Range Airborne ASW Systems (LRAAS)

The LRAAS program is to define the successor to the P-3C maritime patrol aircraft and to develop a cost-effective land-based supplement to our sea-based, anti-ship, and anti-air forces. The LRAAS will be designed to counter the threat projected for the 1990s. A number of competitive system concepts, including modifications to existing aircraft, are being studied. Particular attention is being paid to potentially least-cost options based on existing systems. These investigations will continue in FY 1981, for which $5.0 million in RDT&E funds is requested.

(7) Attack Submarines

Submarine alternative studies are examining SSN new construction options which would be available in the FY 1983 timeframe. The SSN chosen will be a follow-on to the SSN-688 class. Further studies and R&D are on-going to determine technology that holds promise, in the 1990s, for a capable attack submarine that we can afford to build in the numbers required to maintain desired force levels. Advanced design diesel powered submarines are also being examined to ascertain if they would be more cost effective for certain missions. FY 1981 funding of $66.7 million for RDT&E is requested to pursue these studies and for concept formulation.

(8) P-3 Modernization

This effort will enable us to derive the maximum benefit from the service life extension of the P-3 aircraft from 20 to 28 years by bringing some of its integral subsystems up to date in performance capability, e.g., ESM system, communication suite, and advanced acoustic and non-acoustic processing. FY 1981 funding of $32.7 million is requested for RDT&E to continue hardware and software integration and qualification.

5. Mine Warfare and Mine Countermeasures

a. Strategy

The naval mine is a highly cost effective weapon. The Soviets have long recognized the utility of mines and have developed large mine stockpiles which include new types capable of providing a threat in deep ocean areas and the means for fast delivery of a

large number of mines. Our mine warfare program will be closely coordinated with our allies to develop a family of mines consistent with the NATO Long Term Defense Plan.

To counter the existing and projected Soviet mining threat to U.S. and NATO naval forces and merchant shipping in shallow water, we are developing new and improved helicopter mine sweeping equipment for quick, independent, reactive operations. We are also developing a totally new capability to hunt mines, including buried mines, from helicopters. The Soviet deep water mine threat will be countered by new hunting and sweeping systems being developed for a new mine countermeasures ship.

b. Key Programs

(1) CAPTOR Mine

CAPTOR production has been maintained at a low level until sufficient testing is completed to demonstrate a satisfactory level of performance and reliability. Reliability has been proven satisfactory. However, performance requires further improvement. Testing of modifications in FY 80 will serve as the basis for a DSARC III decision and outyear procurement. In FY 1981, $6.0 million in RDT&E is requested for additional system improvement and testing or for the initiation of a new deep water mine program if the CAPTOR modifications do not provide the desired level of performance.

(2) Intermediate Water Depth (IWD) Mine

The IWD mine is a dual purpose (anti-submarine and anti-ship) weapon which will cover a range of water depths. Two contractors were selected for award of demonstration and validation phase contracts in FY 1980. In FY 1981, $19.9 million in RDT&E is requested to continue design and fabrication of advanced development models and initiate in-water sub-system tests.

(3) Quickstrike

Quickstrike is a family of shallow water bottom mines based primarily on conversion of existing ordnance (bombs and torpedoes). An exception is the 2000 lb MK 65 mine. In FY 1981, a partial procurement of the total inventory objective is planned. The target detection device, TDD-57, employing magnetic and seismic influence mechanisms, will convert MK 80 series bombs to mines. Procurement of 2000 TDD-57s is planned in 1981.

In RDT&E, the conversion of the MK 37 torpedo into the sub-launched mobile mine (SLMM) will commence operational evaluation (OPEVAL) in FY 1980. SLMM will provide the fleet with a covert stand-off mining capability. The conversion of the MK 84 bomb will commence technical evaluation (TECHEVAL) in FY 1981.

The requested FY 1981 funding for Quickstrike is $5.7 million in RDT&E and $9.6 million in procurement.

(4) CH/MH-53E

The MH-53E is the designation of the CH-53E helicopter configured to conduct airborne mine countermeasures (AMCM). This

program will provide helicopter modifications to permit night operations, operations with a greater margin of safety, and improved reliability and maintainability. In FY 1981 $16.0 million of RDT&E funds is requested to initiate prototype modification.

6. Multimission Naval Systems

a. Strategy

This mission area includes weapon systems and their subcomponents that are capable of performing multiple missions or being employed in ships or aircraft that are designated for one or more missions, e.g., VSTOL, LCAC, etc. Approximately $530 million is requested in FY 1981 for ship and aircraft design and to pursue a variety of ship and aircraft improvements, e.g., ship data multiplex system, increased survivability, improved nuclear and non-nuclear propulsion systems, etc. Some of these improvements will be incorporated in ship and aircraft designs over the next five years.

b. Key Programs

(1) VSTOL

The Navy is continuing a systematic and complete investigation of alternatives for a new design, follow-on aircraft for the present force. Study efforts are underway to investigate alternatives for future sea-based aircraft. The CNO Sea-Based Air Master Study Plan is investigating four possible alternatives for future sea-based aircraft to determine which will be the most cost-effective. Systems under review are Conventional Takeoff and Landing (CTOL), Short Takeoff and Landing (STOL), Short Takeoff, Vertical Landing (STOVL), and the VSTOL concept. Concurrently, Naval Air

Systems Command is funding industry to analyze VSTOL operational concepts and program approaches for future VSTOL aircraft weapons systems. The Navy is pursuing a technology development program to provide advances in propulsion, avionics, and structural aircraft technology to reduce weight and improve performance. The FY 1981 budget request includes $16.8 million to continue this effort.

(2) Air Cushion Landing Craft (LCAC)

The LCAC with their high speed and their ability to land heavy equipment and personnel beyond the surf line will provide the Marines with a significant tactical advantage over current landing craft. They will allow amphibious force ships to launch assaults greater distances from the beach and will permit amphibious landings over steep gradient beaches untenable to current landing craft. Development of the LCAC will continue with $22.2 million requested in FY 1981. Production is tentatively scheduled to start in the mid-1980s with a total buy of 60 craft currently planned.

F. MOBILITY

1. Introduction

Mobility forces should enable us to deploy our general purpose forces rapidly to overseas theaters, to increase their flexibility when deployed, to provide for their logistic support, and to resupply our Allies.

2. Air Mobility

a. Strategy

Airlift is used to project and sustain manpower and firepower when other means of transportation are not available or responsive. The airlift force must be balanced to insure long range, short range, and small field capability. It will be designed to meet our needs to deploy and sustain elements of a Rapid Deployment Force on a worldwide basis or to rapidly reinforce NATO in a major conflict.

For the past several years, we have considered developing and acquiring an Advanced Medium STOL Transport (AMST) aircraft to modernize the tactical airlift force and provide it with an intratheater outsize cargo and STOL capability. While urgent, we did not consider tactical airlift modernization as pressing as other tactical force improvements. With the emphasis on the concept of a Rapid Deployment Force and additional requirements for prepositioning of POMCUS equipment for a NATO conflict, we see an increased need for a long range airlift capability. Accordingly, we have decided to request funds to develop and procure a new airlift aircraft which we are ılling the C-X.

b. Key Programs

(1) Fixed Wing Aircraft Programs

(a) C-X

The C-X aircraft will have the capability to airlift, over intercontinental ranges, large military equipment which cannot be carried by the C-130/C-141. Specific characteristics will be determined on the basis of requirements derived from an evaluation of 5 representative worldwide scenarios (geographic locations and conditions). The flexibility to operate from austere airfields within the theater will be an important factor in the evaluation. The C-X could be a derivative of existing military or civilian aircraft or a new aircraft based on proven technology. An assessment will be made to determine if variants could be used to satisfy other mission requirements (for example, CMCA). We are requesting $80.7 million for FY 1981 to begin full-scale development activities.

(b) C-5A Wing Modifications

Fatigue life of the C-5A wing is inadequate and will result in average projected aircraft life of 7,100 flight hours. To achieve the required aircraft life of 30,000 flight hours, modification and strengthening of the wing are required. Following a favorable Milestone III production decision in early 1980, fabrication of the initial increment of modification kits will begin. Kit installation will begin in FY 1982. For FY 1981, $11.1 million is requested to continue R&D efforts and $166.7 million is requested for second increment kit fabrication.

(c) C-141 Stretch Modification

The objective of this program is to increase

this aircraft's ability to move cargo by up to 30% and to decrease reliance on foreign bases. This is being accomplished by lengthening the C-141 fuselage by 23.3 feet and by installing an aerial refueling system. No increase in peacetime operating costs results from these capability increases. The first modified C-141 was delivered to the Air Force in December 1979. By the end of FY 1981, 175 modified aircraft will have been delivered. For FY 1981, $25.6 million is requested for continued modification.

(d) Civil Reserve Air Fleet (CRAF) Enhancement

The objective of the CRAF program is to incorporate cargo convertibility features into production, wide-body L-1011, DC-10, and 747 commercial passenger aircraft. These aircraft would then be used in times of national emergency to augment our existing airlift fleet. As an incentive, the commercial carriers will be reimbursed, not only for the cost of the modification, but also for their added operating expense program has as its goal a capability equivalent of 65 747s by FY 1986. Approximately six aircraft are planned to be modified in FY 1980. For FY 1981, $78.9 million is requested to continue this program.

(2) Helicopter Programs

(a) Blackhawk

The UH-60A helicopter (Blackhawk) is being procured by the Army to replace the aging UH-1 series in the air assault, air cavalry, and aeromedical missions. With major design emphasis on reliability, maintainability, and survivability, it is expected to provide dramatic savings in operational support and life

cycle costs. IOC was attained in November 1979 with the first Blackhawk unit of the 101st Airborne Division, Ft. Campbell, Kentucky. For FY 1981, $331.0 million is requested for continued production.

(b) CH-47 Modernization

This program is aimed at improving reliability, maintainability, and safety, while extending the life of the Army's medium-lift helicopters an additional 20 years. The present CH-47 fleet of A, B, and C airframes will be overhauled and the following seven new systems incorporated: (a) fiberglass rotor blades, (b) transmission and drive system, (c) modularized hydraulic system, (d) auxiliary power unit, (e) electrical system, (f) advanced flight control system, and (g) multi-cargo hook load suspension system. In FY 1980, delivery of three prototypes was made to the Army for the design validation flight testing. A Milestone III production decision will be made in 4th Quarter FY 1980. For FY 1981, $195.9 million is requested for the initial year production.

(c) CH-53E Super Stallion

The CH-53E, with a lift capability of over 16 tons, is being procured by the Navy and Marine Corps for heavy helicopter logistics missions. OPEVAL was completed in May 1979. Delivery of the first production aircraft is scheduled for September 1980 and IOC is planned for 2nd Quarter FY 1981. For FY 1981, $193.7 million is requested for continued production.

3. Sea Mobility

a. Strategy

Forces for the defense of the sea lanes are sized to

engage in a worldwide war at sea with the Soviet Union concurrent with a non-NATO contingency since that situation would pose the greatest threat to the sea lanes and cause the maximum flow of essential shipping. A wartime objective of sea lane defense forces is to ensure the delivery of seaborne material to the U.S. and its allies with an acceptable loss rate. Also, to ensure fast response for emerging situations, there is a need to forward deploy military equipment to support a Marine Amphibious Force (MAF). In this regard, it is planned to acquire fourteen Maritime Prepositioning Ships in the Fiscal Year 1981-1985 time frame. Current R&D efforts are aimed at improving underway replenishment equipment and providing a means to transfer cargo and petroleum products ashore under adverse conditions.

b. Key Programs

(1) Maritime Prepositioning Ships

It is planned to procure fourteen multipurpose mobility ships in the Five-Year Defense Plan (two in FY 1981 and three each in FY 1982-85); these ships will be used to forward deploy equipment for one Marine Amphibious Brigade by 1983; a second by 1985; and a third by 1987. The budget is structured to procure a version of the Maritime Administration PD-214 design, the "Security" class ship. Other alternatives of leasing and/or converting existing commercial ships are also being investigated to determine their cost-effectiveness of obtaining an immediate near-term capability while the "Security" class ships are under construction. FY 1981 SCN funding requested is $207 million. If possible, the "Security" class acquisition rate will be accelerated.

G. THEATER AND TACTICAL C3I

1. Theater Command and Control

a. Strategy

Our theater command-and-control (C^2) programs emphasize

- achievement of force management capabilities world-wide, including C^2 means which are deployable to areas where we do not have permanent facilities
- survivability and restorability of essential C^2 functions in key areas
- capability to participate in multi-national defense efforts, support alliance commitments, and manage joint-Service land, sea and air operations efficiently and effectively.

b. Key Programs

i. Joint Crisis Management Capability

Current systems which support rapid control of escalating crises in areas where we do not have established facilities, are deficient. Reaction capabilities under the control of the Joint Chiefs of Staff are aging and do not include essential communications capabilities, and the ability of overseas commands to provide early on-scene assessments to theater headquarters and the Washington area is unacceptably limited. To correct these deficiencies, we have initiated the Joint Crisis Management Capability (JCMC) program, to improve deployable crisis management facilities and communications.

The capability to be provided is separable into four modules:

- A minimum communications package, transportable by many means, to provide secure communications in small crisis situations.

- A rapidly responsive airborne capability to collect information and to relay crisis situation-assessment communications between the crisis scene and appropriate area and national authorities.

- An air and ground transportable system which can provide C^3 for a medium-size joint (air, ground and/or naval) force on the crisis scene while either airborne or on the ground. Operational capability on the ground is expected to be greater than while airborne.

- An air and ground transportable system which augments the C^3I capability of a large crisis management force such as a large joint task force and assures responsiveness to the NCA.

We plan to achieve initial operating capability for the first module in 1983 and for the other modules in 1985. We are requesting $26 million in FY 1981 in support of the JCMC program.

ii. <u>E-3A Airborne Warning and Control System (AWACS)</u>

The E-3A (AWACS) is now operational in the Air Force and available to perform both North American air defense missions and contingency missions world-wide. Its long-range look-down radar surveillance and tracking capabilities, combined with the requisite communication links and on-board computational capability, provide a significant upgrade in both theater-level surveillance and C^2. The NATO AWACS program has entered full-scale acquisition and the central features of the joint U.S.-NATO standard AWACS configuration --

improved maritime surface surveillance capabilities, the Joint Tactical Information Distribution System (JTIDS) terminal described below, and a higher-capacity computer -- were approved for in-line production on the remaining E-3As. RDT&E funds in the amount of $65 million are requested in FY 1981 to continue work on these features and for development and testing of other improvements.

2. Theater Surveillance and Reconnaissance

a. Strategy

The advent of long-range weapons (missiles and strike aircraft) in Soviet land, sea, and air forces has engendered a need for detecting, locating, and classification of such forces at longer range. The excellent range-payload characteristics of our strike aircraft and the range and precision of ground-launched and sea-launched missiles can be fully exploited only if means are available to find and designate targets at long-range with location accuracy consistent with weapon delivery capabilities and with timeliness consistent with tactical war-fighting needs. Theater surveillance and reconnaissance programs are aimed at fulfilling these needs.

b. Key Programs

Key programs include the AWACS, described above, which performs a theater airspace surveillance mission and supports maritime surveillance; and the TR-1, described subsequently, which provides deep surveillance of land targets. The following discussion

deals with our programs in ocean surveillance.

Ocean surveillance is the systematic observation of ocean areas to detect, locate, classify and report selected high-interest aerospace, surface, and subsurface targets. Over-The-Horizon Targeting (OTH-T) is that part of ocean surveillance which supports tactical naval firepower. The U.S. Ocean Surveillance System includes the sources, sensors, communications, data processing, other facilities, personnel, and procedures which are required to provide needed ocean surveillance data to users in a timely manner.

Within the past decade, sophisticated Soviet challenges to U.S. Navy sea control have increased the demand for improved ocean surveillance and considerable efforts have been expended to achieve essential improvements. The improvement program encompasses a wide range of activities spanning all aspects of ocean surveillance.

3. <u>Theater Information Systems</u>

Programs in this mission area are described in Chapter 8.

4. <u>Tactical Command and Control</u>

a. <u>Strategy</u>

Tactical C^2 programs must facilitate interoperability between the Services and with the general purpose forces of our allies, as well as providing required mobility features. Such systems are typically procured in large numbers and can impose substantial burdens for maintenance and logistics support, and emphasis must be placed on

achieving greater utility at lower cost. Our needs must also be resistant to attempts by potential adversaries to exploit critical communications links, and to disrupt command and control processes by jamming and deception.

b. Key Programs

i. Joint Interoperability of Tactical Command and Control Systems (JINTACCS)

The JINTACCS program objective is to test and demonstrate the effectiveness of interacting service tactical command and control systems in joint operations.

Testing of message standards to ensure interoperability between Service intelligence systems and facilities has begun and will continue in FY 1980. We plan to initiate standards testing for the four other JINTACCS functional areas in FY 1981. Configuration management procedures for JINTACCS testing have been implemented, and tests for air operations are being initiated. These tests will be followed by an initial Operational Effectiveness Demonstration (OED) with actual troops in a large-scale joint exercise, to be conducted in FY 1981. OED's for the other JINTACCS functional areas will follow.

Part of the JINTACCS program has been devoted to development of message standards for the Joint Tactical Information Distribution System (JTIDS). The Service and Agencies have unanimously agreed to the JTIDS message structure, which has been

provided to the Program Office in support of the Class II terminal procurement. We are requesting \$47 million for JINTACCS RDT&E in FY 1981.

ii. identification

Positive and reliable identification of friends and foes (IFF) is a capability required by all of our tactical weapon control systems, especially those which can engage targets beyond visual range. The United States is continuing to participate in the formulation of a NATO-wide architecture and development of a future identification system that will overcome shortcomings of the present MARK XII IFF system, which is an early 1960s design. The NATO activity envisions a secure, highly jam-resistant capability for positive identification of foes. Distribution of identification data will be by a multi-function data distribution system to be used throughout NATO. Developments of interrogation-reply approaches are aimed at achieving NATO-wide interoperability in accordance with an agreed NATO technical characteristic. Total research and development funding proposed for IFF in FY 1981 for all the Services is \$44 million.

5. Tactical Reconnaissance, Surveillance, and Target Acquisition

a. Strategy

Tactical Reconnaissance, Surveillance and Target Acquisition (RS&TA) systems are extensions of the tactical commander's eyes and ears, providing wide area or spot target information necessary to direct fire, maneuver forces, and plan the battle. To perform these

functions effectively on the modern battlefield, RS&TA assets must provide all-weather, day-night, real-time response against a growing and more sophisticated target array. Therefore, our programs have the objective of augmenting and improving our current RS&TA capability by extending range and coverage, increasing information processing and dissemination capacity, and reducing vulnerability to enemy countermeasures.

b. Key Programs

i. TR-1

We have ascertained that a high-altitude, long-endurance aircraft equipped with multiple sensors is needed for stand-off surveillance in support of our tactical forces. In addition to facilitating timely allocation of defensive units, such a capability can be used to cue shorter-range surveillance sensors, and will thereby enable more efficient use of such assets in direct-support target acquisition functions. Our new initiative in this regard, started in FY 1979, is the TR-1, a tactical reconnaissance variant of the strategic reconnaissance U-2R aircraft, capable of long loiter, stand-off surveillance from altitudes above 60,000 feet. Equipped with a high-capacity data link and advanced sensors, the TR-1 and associated ground processing facilities will provide continuous day/night all-weather battlefield surveillance of opposing forces with real-time reporting to both Army and Air Force commanders. The Mission Element Need Statement for TR-1 was approved in August of 1979. Work necessary to reopen the U-2R production line

is underway and a production contract was awarded in November 1979. We are requesting $172 million in FY 1981 in support of the TR-1 program. The Air Force has established the COMPASS CAPE Project Office to coordinate and execute mission equipment acquisition, and a joint SAC/TAC/USAFE concept of operations is near completion.

ii. Airborne Reconnaissance Radar Programs

Work on the ASARS I and II synthetic aperture radar development continues. Efforts continue to improve the existing UPD-4, employed on Air Force RF-4C and Marine Corps RF-4E aircraft, and APS-94F, for Army OV-1 aircraft. We plan to deploy a full complement of APS-94F systems, and have initiated development of new capabilities for the Army radars with FY 1981 funds.

iii. Airborne Surveillance Radars--SOTAS and PAVE MOVER

A third initiative comprises programs to provide all-weather stand-off moving target indication (MTI) radar surveillance capable of performing in a heavy jamming environment.

The Stand-Off Target Acquisition System (SOTAS) is an Army helicopter-borne MTI radar providing real-time close-in surveillance to support division and brigade-level battle management and artillery targeting. The EH-60B variant of the BLACKHAWK helicopter has been selected as the radar platform because of its survivability, endurance, and adverse-weather performance. FY 1981 funding requested for SOTAS is $54.8 million.

For the longer term, PAVE MOVER, will provide a wide-area surveillance, detection, and strike capability. The system is designed for low probability of intercept by enemy ELINT sensors, and will provide real-time weapons guidance data and cueing to other sensors. PAVE MOVER is a joint effort of the Air Force and DARPA.

iv. Ground-Based SIGINT Sensors

Ground-based SIGINT sensors are used to intercept emissions from enemy communications and radar transmitters, and provide combat intelligence to tactical ground and air commanders in support of operational planning, maneuver and targeting. They complement airborne systems by providing 24-hour surveillance, albeit over shorter ranges. Requirements for improved capabilities exist in the Army, the Air Force and the Marine Corps. Many of the currently-fielded systems are nearing the end of their useful lives, in terms of supportability. Army activities include deployment of replacement systems such as TEAMPACK and TRAILBLAZER and development of new systems with high levels of automation. Air Force and Marine Corps activities focus on coupling modern receiving and processing technology to systems already in the inventory.

TEAMPACK is a mobile direction-finding system. We are now deploying TEAMPACK. A production contract was awarded in September 1979 for additional units, with an option for further procurement in 1980. RDT&E for TEAMPACK is now essentially complete. TRAILBLAZER is an Army system developed under QRC guidelines.

Existing sets are being deployed and additional sets are being produced under a 1979 contract. Further production is scheduled for 1982.

The Marine Corps Integrated Communications Collection System (ICCS) is designed to replace various non-standard equipments and will provide a modern direction-finding capability. The Signals Intelligence Analysis System (SIAS) is a related Marine Corps project for significantly decreasing the processing time for tactical SIGINT support to lowerechelon combat commanders. SIAS will be interfaced with the ICCS to provide an integrated collection, location, processing and reporting system. $3.0 million is requested for these two projects in FY 1981.

AGTELIS is an Army ground-based system; because of concerns with battlefield mobility and survivability, and because of unresolved deficiencies found in developmental and operational testing, procurement of AGTELIS may be deferred and RDT&E continued through FY 1981. $14.1 million is requested for this project.

TACELIS was developed by the Army as a Corps-support communication intercept system. Practical considerations of survivability and mobility of the present system which arose during testing as well as a need for additional capability at the division level, have led us to defer procurement. A review of the requirement for TACELIS is currently being conducted, and RDT&E will be continued in FY 1981.

V. Airborne SIGINT Sensors

Initial product improvement of the Army GUARDRAIL has been completed and the resulting GUARDRAIL V has been deployed. Further efforts are required to enhance GUARDRAIL utility. We are requesting $51.6 million in FY 1981 for these continuing improvements.

The Air Force is developing an improved system for the TR-1 with primary emphasis on miniaturization and capability to support Army requirements.

vi. Precision Location Strike System (PLSS)

PLSS is intended to provide tactical forces with an all-weather, stand-off precision location and strike system capable of attacks against tactical targets (e.g., command post, and radar facilities) located in the PLSS electronic grid. PLSS can locate both and moving emitting targets.

The program has been restructured in response to current funding constraints and to take advantage of common relay vehicles and data links and consolidation of ground facilities. We estimate that this action will reduce the cost of PLSS to about $0.5 billion, instead of $1.3 billion that was previously estimated. Additional aircraft will be acquired to provide the baseline operational capability. We are requesting $62.3 million for PLSS in FY 1981.

vii. Battlefield Exploitation and Target Acquisition (BETA)

Project BETA is a joint Army, Navy, Air Force

and DARPA program to implement a test-bed to evaluate the ability of automated centers for fusion of multi-sensor information. Such centers will improve the process of location and identification of land targets and facilitate dissemination and portrayal of targeting and battlefield situation data. The BETA test-bed elements will be interoperable and will exchange data in near real time. NATO-based demonstration and evaluation is scheduled for 1980 and will include processed sensor reports from GUARDRAIL V, SOTAS, FIREFINDER, UPD-4, RIVET JOINT, COMPASS EARS, TEREC, and the Navy's EP-3E.

In a related effort, the Air Force is developing automated correlation systems to assimilate and integrate data from multiple collectors, for rapid identification of threat emitters and event profiling. The application of automation techniques is also being examined, with the objective of reducing the volume of surveillance data that must be disseminated to battle execution centers by correlating as much data as possible in near real time.

6. Tactical Communications

a. Strategy

Our acquisition strategy for tactical communications systems and equipment must take into account competing requirements. First, there is a need to achieve better performance and utility. Our current efforts are aimed at improving capability to perform in a jamming environment, increasing survivability, mobility and reliability, and providing means to secure tactical links and circuits against exploitation. Modern technology permitssuch

advances to be made, but at the same time it is necessary to improve interoperability with allied systems, and in the case of a replacement capability, to retain compatibility with deployed equipment to ensure a smooth transition.

b. Key Programs

i. Ground Mobile Forces (GMF) Satellite Communications

The GMF Program is to provide terminals, multiplex anti-jam control modern and ancillary equipment to support Army, Air Force and Marine Corps tactical communication requirements. GMF terminals will provide the tactical forces with reliable communication links that are independent of terrestrial networks and the physical conditions of the terrain where operations are being supported. The terminals are all transportable.

Major GMF procurement activities include:

- A multi-year contract for 210 MSC-64 terminals. FY 1981 funding of $22.2 million will be requested to procure 75 terminals.

- Procurement of TSC-94A and TSC-100A terminals for the Air Force, starting in FY 1981. Funding of $15.5 million is requested for four of each.

- A multi-year contract for 225 TSC-85 and TSC-93 terminals for the Army, awarded in FY 1979. We are requesting $20.3 million on FY 1981 and expect to complete procurement in FY 1983. We are planning to retrofit 25 terminals procured under the initial contract for added anti-jam capability in FY 1982-83.

- A follow-on buy of 100 PSC-1 manpack terminals.

- The MSC-65 terminal is being evaluated for possible Army procurement beginning in FY 1981.

ii. The Joint Tactical Communications Program (TRI-TAC)

TRI-TAC is an all-Service program to acquire

interoperable, standardized, multichannel, switched communications systems. The TRI-TAC architecture takes advantage of U.S. and Allied investments in existing tactical communication equipment while facilitating the introduction of improved systems. TRI-TAC will provide much needed overall communications security, and the new systems will be highly reliable and rapidly deployable. Use of automatic switching and control will provide for rapid and timely transmission of messages, data and voice communications.

TRI-TAC developments are well underway, and will provide a family of large and small message and circuit switches, communications security equipment, systems control facilities, multiplex and transmission equipment, terminal devices, and interface hardware. Operational tests of the large switches is nearly complete and a DSARC for those switches is planned for March 1980. Approval for procurement of an initial quantity of switches using Air Force and Army FY 1980 procurement funds is anticipated. Testing of TRC-170 tropospheric scatter communication terminals and associated Digital Group Multiplex (DGM) equipments will also be completed during FY 1980 and will lead to procurement in FY 1981. Total procurement funding requested for FY 1981 is $137 million, to obtain additional large switches for the Army and initital quantities of TRC-170/DGM equipments for the Air Force. We are requesting $81 million in FY 1981 for continuation of TRI-TAC RDT&E Programs.

iii. Joint Tactical Information Distribution System (JTIDS)

JTIDS is a joint-Service development program to

provide jam-resistant, secure, integrated data and limited voice communications, relative positioning and identification capabilities to tactical forces. It will be the primary tactical distribution system for digital data. JTIDS has demonstrated electromagnetic compatibility with other systems in the same frequency band and received national frequency allocation in December, 1979.

Current development efforts center on two classes of terminals. Class I terminals were approved for production for the E-3A (AWACS) and NATO AEW&C programs in FY 1980 and will be operational in 1982. JTIDS will provide an interface between AWACS and surface C^2 systems via the transparent Adaptable Surface Interface Terminal for U.S. forces, and via JTIDS terminals embedded in the NATO Air Defense Ground Environment for the NATO program.

Full-scale development of Class II terminals (for fighter aircraft and potential Army applications) is planned for mid-1980, and a decision will be made concerning enhanced architectures for early 1981. \$102.7 million is requested for non-AWACS JTIDS RDT&E in FY 1981. In furtherance of our 1976 offer of JTIDS to NATO, a year-long study of multi-mission systems, known as Multifunctional Information Distribution Systems (MIDS), began in July 1979.

iv. Combat Net Radio

Command-and-control of tactical forces is exercised primarily through the use of combat net radios (CNR). The Army is developing, for the use by all Services, a secure, jam-resistant CNR, including manpack, vehicular and airborne versions. The

program, in the advanced development phase, is called the Single Channel Ground and Airborne Radio Subsystem (SINCGARS-V), and the Army is presently determining whether fielding of the equipment could be accelerated to about two years earlier than the planned IOC in late 1986. Total procurement will be almost 200,000 radios and 30,000 electronic counter-countermeasures (ECCM) modules. The U.S., in an effort to further interoperability in the ECCM mode and development of NATO technical standards for ECCM, will sign a Memorandum of Understanding with several NATO nations, allowing them to participate in the SINCGARS-V program's Interface Control and Test Integration Working Groups. We are requesting $16 million for SINCGARS-V RDT&E in FY 1981.

v. <u>ECCM for Airborne Radios</u>

The Air Force HAVE QUICK and SEEK TALK programs will provide an ECCM capability for the presently operational ARC-164, used for air-to-air and air-to-ground operations. RDT&E funding in the amount of $44.6 million is requested for FY 1981. HAVE QUICK will enter production in July 1980 with equipment deliveries starting in late 1980. Modification of the radio will be accomplished by Service Personnel. SEEK TALK will combine pseudo-random noise modulation and adaptive antenna techniques to provide anti-jam protection against post-1985 threats. The program is in the advanced development stage. However, the Air Force has decided to accelerate the program by at least one year by starting production in 1983 instead of 1984. Planned production is approximately 8700 units.

7. Electronic Warfare (EW) and Counter-C^3

a. Strategy

EW systems provide needed means for offsetting technological advances in the deployed weapons of opposing forces, whether they be intended for use against ground, air, or naval targets. EW can operate in several ways to reduce the effectiveness of such weapons, and thereby helps restore the balance against numerically superior forces.

The Soviet Union and its Warsaw Pact allies continue to make advances in military surveillance, communications, and command and control, with the prospect of substantial improvements in Pact capabilities for precise and timely force management. Complementing our EW initiatives are programs to provide means to degrade enemy force management capabilities in the event of hostilities.

b. Key Programs

Highlights of the FY 1981 EW and Counter-C^3 program are:

o Development of expendable jammers will be continued. These jammers are called for under the NATO Long Term Defense Program.

o Engineering development of the Army's MLQ-33 system. will be completed.

o Production of the Army's MLQ-34 (TACJAM) will continue.

o Improvements to the shipborne SLQ-32 will be developed to make the system more effective against newly deployed Soviet missiles, and developments of other tactical counter-C^3

capabilities against anti-ship attacks are being accelerated.

o Joint Navy/Air Force development of the Airborne Self-Protection Jammer (ASPJ), the next-generation internally carried system, following the ALQ-131 which is in full-scale production, will be initiated.

o The Army will examine use of ASPJ technology continue development of the ALQ-136 -- a derivative of the Navy ALQ-129 -- and integration of the Navy ALQ-162 system.

o Mutual-support jamming capabilities of the EA-6B and EF-111A will be updated and augmented.

o Development of the COMPASS CALL EC-130 aircraft will continue; the Air Force will closely coordinate this program with Army programs.

VIII. DEFENSE-WIDE COMMAND, CONTROL, COMMUNICATIONS AND INTELLIGENCE (C^3I)

A. C^3I REQUIREMENTS

Our C^3I systems must support the command function at all echelons, have flexibility to cope with evolving threats and be consistent with planned force composition and employment. C^3I systems must facilitate conduct of U.S. joint operations worldwide and combined operations with Allied forces. Strategic C^3I programs were discussed in Chapter VI, and theater and tactical programs were discussed in Chapter VII, Defense-wide programs provide an essential backbone for our military capabilities. The following are key requirements for Defense-wide C^3 systems:

- o Worldwide, jam-resistant secure communications that are resistant to nuclear effects are needed to link decision makers with commanders in the U.S. and overseas.

- o U.S. military forces throughout the world need secure jam-resistant voice, digital data, and message services to support general C^3 functions. Present facilities of the Defense Communications System (DCS) include obsolete equipment which are vulnerable. Improvements are needed to enhance survivability, accommodate future digital circuit requirements, reduce operation and maintenance costs, and improve interoperability with allied systems.

- o It is National policy to protect U.S. government telecommunications which carry traffic essential to our national security from intrusion, deception and exploitation. Protection for CONUS links and a global secure-voice switched network are needed.

- o Accurate, secure, jam-resistant, all-weather/all-hours navigation and position-fixing is needed for precise world-wide control of forces, with a common grid for reconnaissance, surveillance, and weapon-control functions.

Defense intelligence has four major objectives:

- Support operational commanders, during peacetime and all phases of military conflict.

- Provide indications and warning information concerning capabilities and preparation for attack by hostile powers on the U.S. or its Allies and other situations affecting the national interest.

- Support national-level intelligence needs, of the NCA, for policy and planning, and of the Director of Central Intelligence for national foreign intelligence.

- Support Departmental requirements, to promote readiness, develop U.S. weapon systems and policy, and arm and structure the combat forces of the U.S.

Some areas of Defense intelligence requiring improvement are:

- Wartime survivability and endurance of intelligence assets.

- Interoperability of intelligence assets with our C^3 structure, to insure that intelligence can be provided in a timely manner to commanders.

- Mapping, charting, and geodesy support, to achieve improved accuracies for new weapons systems.

- Long-range technical threat projections, in support of weapon system acquisition decision-making.

- Capability to monitor enemy activities at night or in bad weather, for indications and warning, support to combat commanders, and treaty-compliance monitoring.

B. INTELLIGENCE PROGRAMS

1. National Intelligence

The national intelligence effort is embodied in the National Foreign Intelligence Program (NFIP), which comprises a significant portion of the intelligence efforts of the Departments of Defense, State, Energy, and Treasury, and the Drug Enforcement Agency,

as well as the CIA and the counterintelligence efforts of the FBI.

Within the Defense portion of the NFIP, there are five major intelligence programs--the Consolidated Cryptologic Program, General Defense Intelligence Program, Air Force and Navy Special Activities, and DoD Foreign Counterintelligence Activities.

Within the Defense budget are programs integral to the strategic and general purpose forces and which support tactical commanders in the use of their forces. These activities, as a secondary function, provide intelligence to national-level consumers, as national intelligence programs provide information for military commanders. The two processes are complementary, rather than duplicative.

2. Tactical Cryptologic Program

The Tactical Cryptologic Program (TCP) is a new major component of DoD tactical intelligence and related activities. The long-range goal of the TCP is to maintain and selectively strengthen the capability to provide effective SIGINT to the commanders of combat forces. The major objective is to provide a structure within DoD for tactical SIGINT systems to ensure maximum interoperability, minimize duplication, and produce a sound R&D, procurement, operations and training base consistent with service missions, personnel capabilities and force levels. Some specific TCP assets such as the Army's AGTELIS and GUARDRAIL systems, are discussed in Chapter VII, Section G -- Theater and Tactical C^3I.

3. <u>Intelligence Support to Tactical Forces</u>

During the past year we have addressed potential improvements to timely intelligence support to tactical forces. The specific objectives are to enhance qualitatively the multi-source information which is essential to combat commanders and directly related to their missions. The requirements encompass correlating and disseminating highly perishable data quickly enough to accomplish combat decisions and actions. We have made significant progress in defining intelligence support requirements of operational military forces, and in developing more effective mechanisms for guidance and review in the planning, programming and budgeting process. Our long-term goal is to develop a requirements-oriented acquisition strategy with overall resource allocations for Defense NFIP, tactical intelligence and related activities that will ensure the most effective peacetime and wartime intelligence support to tactical commanders.

C. JOINT AND MULTISERVICE PROGRAMS

1. <u>Jam-Resistant Secure Communications (JRSC)</u>

The JRSC Program will provide highly transportable satellite ground terminals operating at SHF to major command locations, and selected sensor sites. This deployment will assure major commanders of Jam-resistant communications capability independent of DCS terrestrial interconnections under stressed conditions. A production contract will be awarded in mid-1980, with the first terminal scheduled for operation in mid-1982. The $47.8

million in the FY 1981 request will be used to maintain the optimum production deliveries for JRSC satellite terminals and related equipment.

2. Joint Service Weapons Data Link (JSWDL)

The effectiveness of weapons controlled and guided by data links will be determined to a great extent by the resistance of the system to unintentional interference and jamming. JSWDL is a joint Army and Air Force effort to develop qualified electronic modules and subassemblies for a variety of weapon data link applications. The aim is to reduce life-cycle costs and provide growth potential in performance. The project is jointly funded through the PLSS, RPV, and SOTAS programs through FY 1983. A generic modular architecutre will be approved in 1980, and initial tests are scheduled for late 1983. An acquisition strategy, including means for maintaining a competitive industrial base, will be recommended with the aim of establishing a production schedule that is responsive to all users of the modules and subsystems.

D. POSITION-FIXING AND NAVIGATION

1. Satellite Navigation

The NAVSTAR Global Positioning System (GPS) program will provide the backbone for future DoD navigation and position-fixing capabilities. The program envisions an initial deployment of 18 satellites in 3 orthogonal orbital planes at an altitude of 11,000 nm. The system will provide a global common grid, and users will be able to obtain precise three-dimensional position and

velocity data and time, continuously and under all weather conditions. Combat and support aircraft, vehicles, ships and troops will be able to obtain such information without radiating potentially compromising signals, as is the case with some currently deployed position-fixing systems. GPS will play a role in instrumentation for achievement of improved ballistic missile accuracy under the Navy's TRIDENT Improved Accuracy Program. Secondary payloads carried by GPS include nuclear detonation detection sensors of the Integrated Operational Nuclear Detection System (IONDS) and possibly AFSATCOM single-channel transponders. These payloads are described in Chapter VI.

The Defense Systems Acquisition Review Council has recommended entry of NAVSTAR GPS into full-scale engineering development, and the Secretary of Defense approved that recommendation in August of 1979. The FY 1981 request of $168 million provides funds for competitive development of user equipment as well as development of the space and ground control segment.

2. Mapping, Charting and Geodesy (MC&G)

MC&G R&D encompasses a wide range of techniques such as satellite-to-satellite tracking, satellite altimetry, very long baseline interferometry and inertial technology to achieve improvements in positioning capabilities for both terrestrial and space systems. Development of a spacecraft receiver continues to receive special attention. Other programs are underway to improve target positioning and gravity effects on inertial guidance and navigation systems. These efforts bear directly on achievement of greater

effectiveness of ballistic missile systems such as the M-X. Additional MC&G R&D efforts include simulation techniques for preparation of target reference scenes required for guidance of the PERSHING II missile and in support of DARPA's advanced cruise missile technology programs. TERCOM matrices are being produced for use in cruise missiles and other systems which enploy terrain comparison guidance and correlation navigation methods. Photo-bathymetric methods for shoal detection and remote sensing techniques for terrain analysis are being investigated to support military needs for geographic intelligence.

E. DEFENSE-WIDE COMMUNICATIONS PROGRAMS

1. The Defense Satellite Communications Systems (DSCS)

DSCS, a Super High Frequency (SHF) satellite communications system, is key to linking the NCA and other priority U.S. agencies with forces located overseas. In addition to large fixed terminals, mobile terminals will be available to support WWMCCS requirements and some tactical Service requirements. The demand for DSCS capacity, area coverage, and reliability has established the need for a six-satellite space segment comprised of four active sateliites and two in-orbit spares. The space segment now consists of six DSCS II satellites, located over the Atlantic, Western Pacific, Eastern Pacific and Indian Ocean areas. To maintain this system until follow-on DSCS III satellites are available, replenishment satellites will be needed. Two are now in production, and are currently scheduled for launch with the DSCS III Demonstration Flight satellites discussed below. There are strong indications that two more DSCS II satellites may be

needed to assure communications continuity until full DSCS III capabilities become available in mid-to-late 1984.

DSCS III is being developed to provide greater satellite life and a major increase in communications capability over the DSCS II satellites. A number of improvements are being incorporated, including multi-beam antennas that will provide greater service to both large, small, and mobile terminals, and significantly better performance against jamming signals. Two R&D DSCS III Demonstration Flight Satellites are being procured and the first is now scheduled to be launched for on-orbit validation tests in 1981. In FY 1981, we plan to complete funding for long-lead items for the first four DSCS III production satellites, acquisition of which is planned in 1982.

2. Secure Voice Improvement Program (SVIP)

The Defense Communication System SVIP objective is to provide secure voice capability to approximately 10,000 DoD users and be interoperable with the major new secure voice initiatives of our tactical forces, NATO allies and the non-DoD elements of the Federal Government. The program was restructured in response to FY 1979 Congressional guidance and the new concept was approved by Congress in the FY 1980 budget review cycle. The current secure voice capability for our users is severely limited in quantity, quality, interoperability and flexibility to meet crises conditions. The FY 1981 budget request includes $14.9 million for development and initial testing of the SVIP; procurement is scheduled to begin in FY 1982.

3. <u>AUTODIN I and AUTODIN II</u>

The Automatic Digital Network (AUTODIN) is the principal switched digital communications network for data and narrative communications of the DoD. AUTODIN I has been in operation since the mid-1960's, and will continue to be the primary DoD message switching system until the mid-1980's. AUTODIN II will achieve IOC in April 1980, and provide query-response and interactive computer communications support and AUTODIN I connectivity. The initial stage of the AUTODIN II program will provide DoD with the ability to meet the majority of the projected long-haul data communications needs in CONUS. Its rapid response capability will allow us to eliminate a number of dedicated computer networks. Plans for extending AUTODIN II service overseas are currently under development. We are requesting $16.7 million in FY 1981 to lease the AUTODIN II in both CONUS and overseas.

AUTODIN II will constitute the primary transmission segment of the SAC Digital Network (SACDIN). SACDIN will convey two-way, hard-copy, secure command-and-control data messages between CINCSAC and his SIOP Executing Force Commanders. SACDIN will replace the existing dedicated SAC Data Transmission Subsystem and eliminate the need for dedicated transmission and switching systems. The SACDIN budget request for FY 1981 is $23 million for research and development.

4. <u>Digital European Backbone (DEB)</u>

DEB is an ongoing program that will convert a major portion of the existing European DCS to an all digital system. Phase I

of the four-phase program was declared fully operational on 13 November 1979. This phase of the program provides digital transmission facilities from Coltano, Italy, to HQ USEUCOM at Vaihingen, Germany. The remaining three phases will extend the digital backbone through Germany, the Benelux nations, and to Croughton, England and also connect U.S. base locations throughout these countries into the backbone system. With the implementation of DEB, voice communications and data traversing the DCS will be encrypted, thereby denying critical information to enemy intelligence sources. Full operational capability for all four phases of DEB is presently planned for 1985 and 1986. The FY 1981 procurement request is $17.0 million.

5. NATO/U.S. Interoperability and Mutual Efforts

a. Satellite Communications (SATCOM) Sharing

The U.S., U.K. and NATO have signed a Memorandum of Understanding (MOU) that provide for sharing of power and bandwidth to satisfy critical communications requirements in the event of a satellite failure to either of the other's systems. This capability has proved to be invaluable for the U.S. on several occasions. After a launch delay seriously degraded DSCS service. NATO launched its NATO III B satellite early and positioned it over the Eastern Pacific for U.S. use in 1977. The initial one-year loan was extended when the U.S. experienced a launch failure in 1978. In early 1979, we returned the NATO III B to the Atlantic where it remains as a NATO back-up. The U.S. and NATO defense satellite systems will be even more supportive and interoperable in the 1980's when the DSCS III and

NATO IV space segments become operational. U.S. involvement in NATO IV design, as well as the consideration of DSCS III satellites for the NATO IV system, is resulting in many common features. Consequently, NATO IV may look exactly like a DSCS III, or it will be a design that is similar enough to be extremely useful to the U.S. in an emergency.

b. Mutual U.S./NATO Support

The NATO Integrated Communications System (NICS) is designed to meet the political and command-and-control communications requirements of NATO civil and military authorities. The first stage which provides automated record and voice communications and a limited degree of communications security, is being implemented and will be completed in the early 1980's. The architecture for NICS Stage II foresees an all-digital, survivable and secure network interlinked with commercial telephone systems and national strategic and tactical networks. It is programmed to be completed by the end of the century at an estimated cost of $1.5 billion. As projects are completed, NATO's communications are improved on an incremental basis. We are taking several actions to interconnect our communications systems with those of NATO. They include:

- Interconnection of the NATO tropospheric scatter communications system and the DCS (accomplished)
- Interconnection of NATO's record traffic network with the U.S. AUTODIN (agreed)
- Automated interoperation of the NICS TARE and U.S. AUTODIN systems (agreed)

- Automated interoperation of the NICS IVSN and U.S. AUTOVON systems (agreed)

- Joint use of the Iceland SATCOM Ground Terminal (agreed)

- Interconnection of U.S. tactical systems with the NICS through the NATO standardization program (STANAG) 5040 interface unit (underway)

- Plans for automated interconnection of U.S. tactical and strategic communications systems with the NICS Stage II (underway).

As design and implementation proceeds, greater resource commitment and coordination will be required to fulfill our responsibilities in support of the evolving NICS. The Director, DCA, has been designated the U.S. Manager for coordination of U.S. National projects identified in NICS plans and programs for implementation.

c. Consolidation of U.S. and NATO Communications Facilities

Several actions which are underway or complete will increase the flexibility and interoperability of U.S. and NATO C^3 systems in the Norfolk, Virginia area. In 1978, the SACLANT and CINCLANT communications centers were consolidated. Additionally, a joint U.S./NATO transmission link connecting collocated satellite ground terminals in Northwest, Virginia to SACLANT and CINCLANT headquarters in Norfolk, Virginia is planned to be operational in early 1981. SACLANT has recently initiated an effort to interconnect the NATO Command and Control Information System (CCIS) with the U.S. Navy Local Digital Message Exchange to speed message handling. The

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THE FY 1981 DEPARTMENT OF DEFENSE PROGRAM FOR RESEARCH, DEVELOP--ETC(U)

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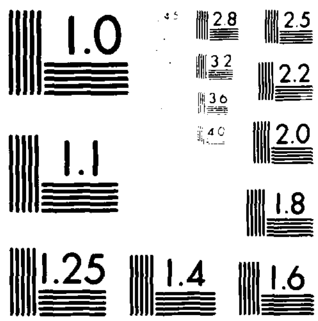


MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS-1963-A

U.S. Navy is preparing a technical analysis and cost estimate of this interconnection while SACLANT is conducting a study of the technical ramifications of the interconnection on the NATO CCIS.

6. <u>Communications Security (COMSEC)</u>

DoD communications Security (COMSEC) programs are directed toward providing sufficient security for U.S. Government telecommunications systems so that the intelligence value to the opposition to be gained from exploiting these systems will be less than the cost of doing so, in terms of time, difficulty and expense. Achieving these objectives requires not only the procurement of cryptographic equipment for protecting voice, record and data communications and telemetry signals, but also an increasing commitment to threat and vulnerability assessment programs to help identify, describe and prioritize vulnerabilities, and a strong technology program to reduce power requirements and lower cost, while meeting the need to protect links operating at higher data rates and to achieve improved reliability and survivability. Use of existing transmission facilities necessitates greater sophistication in equipments. Applications of commercially available, low-cost microprocessors are being pursued. Other developments are aimed at integrating appropriate COMSEC measures during the early design and development phases into new and advanced communications systems, including general and special purpose air, sea and land networks, command and telemetry of space and weapon systems, and nuclear command and control.

IX

IX. DEFENSE-WIDE MISSION SUPPORT

A. TEST and EVALUATION

1. Objective. The major objectives of DOD Test and Evaluation Programs are to:

- Conduct development test and evaluation necessary to assist development of weapon systems and to reduce to a minimum the acquisition risks associated with weapon procurements.

- Conduct operational test and evaluation necessary to determine the operational effectiveness and suitability characteristics of systems in the acquisition cycle.

- Provide credible independent assessments of the technical, operational and support characteristics of DOD weapon systems to support the acquisition decision process.

- Develop and maintain a major range and test facility base to support weapon system test and evaluation.

- Conduct joint Service test programs which address tactics and hardware development, adequacy of doctrine and strategy and long range support and force planning concepts.

- Conduct foreign weapon testing and evaluation in support of foreign weapon procurement activities.

2. Major Weapon System Testing. Major defense system programs for which significant testing is planned in FY 1981 are shown in Table IX-1, categorized by their present relationship to Defense Systems Acquisition Review Council (DSARC) milestones.

We conduct test and evaluation primarily to support the acquisition of militarily effective and reliable systems for our operating forces. To accomplish this, we continue to emphasize the early analysis and establishment of test objectives and the timely

TABLE IX-1

MAJOR DEFENSE PROGRAMS

Testing in Preparation for Milestone II Decision	Testing in Preparation for Milestone III Decision	Post Milestone III Testing
WAAM	F-18	EF-111A
AMRAAM	AV-8B	C-5 Wing Mod
ALWT	ASPJ	Adv Tanker/Cargo Acft
LCAC	HARM	CH-47D
IWD Mine	IIR Maverick	Patriot
5" RAM	AAH	Roland
TRITAC Components	JTIDS (Class II Term)	GSRS
ASALM	SOTAS	XM-1
	PLSS	DIVAD
	AIM-7M	hellfire
	AIM-9M	Copperhead
	TACTASS	FVS
	MX	GBU-15
	LAMPS	JTIDS
	E-4B	CIWS
	SURTASS	SSN-688
	CAPTOR	SOSUS
	SLCM	AEGIS/CSED
	GLCM	DDG-47
	PERSHING II	ASMD-EW
	SPACE SHUTTLE/IUS	TRIDENT I
		ALCM

completion and submittal of Test and Evaluation Master Plans (TEMPs) as an integral part of the acquisition program.

We continue to support the activities of the independent Service test agencies. They play a key role in the DoD weapons acquisition process and have been successful over the years in sponsoring significant improvements in procedures and techniques which are responsible for the high level of scientific thoroughness reflected in their weapon system performance assessments.

a. Updated Policy Guidance. DODD 5000.3 has been revised to improve support of the overall DoD weapon system test and evaluation effort. This directive, in conjunction with DODD 5000.1 and 5000.2, will provide the Services with the guidance necessary to tailor individual acquisition program and T&E activities to federal procurement policies.

b. System Testing Status and Trends. In order to formulate T&E policy guidance for future years, it is necessary to assess accurately the present status and trends of such efforts. This was the objective of the recently completed Operational Suitability Verification Study, Phase I, which was sponsored in part by the Director of Defense Test and Evaluation. This study reviewed aspects of system suitability verification testing that have been the source of problems in the past. Phase II of the study will address policies and procedures to provide future emphasis on those aspects of suitability verification.

3. Test and Evaluation Support Effort

a. Test Facilities and Resources. Policies for management and operation of DoD ranges and test facilities composing the Major

Range and Test Facility Base (MRTFB) contained in DODD 3200.11, are being refined to increase test support efficiency. The principal policy changes place all T&E facilities under the Uniform Funding Policy and require full reimbursement from non-DOD users. Additional policy updates address avoidance of unnecessary duplication of test capability and require a range usage priority system that gives equitable consideration to all prospective DOD users regardless of component affiliation.

The program of accelerated improvement and modernization of the MRTFB continues. Navy T&E activities are already seeing benefits from their program initiated in FY 1979. For example, the Central Scientific Computer program at the Naval Air Test Center augments the existing real-time telemetry system to provide earlier and more complete reduced data. This is directly benefiting the F-18 program, the initial user of the enhanced capability. The Extended Area Test System (EATS) at the Pacific Missile Test Center continues on schedule with initial capability in FY 1981. The EATS will allow complete control and data gathering for development and operational tests which must take place beyond line of sight of the current land based facilities. The construction of the Aeropropulsion Systems Test Facility at the Arnold Engineering Development Center continues toward an IOC in 1983. I am extremely pleased with our progress in this area; large benefits will accrue in terms of better data, faster turnaround, and increased efficiency.

Last year, I expressed concern over maintenance and manning levels and the resulting increase in the backlog of T&E

workloads. A program of contractor augmentation among the Army T&E activities is being implemented with the specific objective of reducing the workload backlog. While we will not reduce the backlog of maintenance and repair in 1981, we will finally reverse the trend of year to year increases.

b. Aerial Targets Program. Meaningful test and evaluation of many major weapon systems is dependent on the availability of aerial targets which realistically simulate threat systems. Programs are underway to provide required full-scale and subscale target vehicles and auxiliary equipments for miss distance scoring, radar and infrared signature generation, countermeasures simulation, and command and control. The Air Force is developing the High-Altitude High-Speed Target (HAHST), a recoverable, supersonic, sub-scale target with onboard scoring and radar augmentation equipment. It will realistically simulate high-performance threat vehicles up to Mach 4 and 100,000 feet. The Navy's FIREBRAND anti-ship missile target is designed to duplicate the threat to the fleet imposed by air- and surface-launched cruise missiles. It will be used to exercise ship defense weapons, particularly in the low-altitude, supersonic regime. These two developments will overcome major deficiencies in our current capability to represent threat system performance. Another cost-effective source of realistic, full-scale targets is the inventory of obsolescent fighter aircraft such as the F-86, F-102, and F-100, which are being droned for remote-control operations.

c. Foreign Test and Evaluation . Beginning in FY 1980, the Foreign Weapons Evaluation program and its associated appropriation have

been placed by Congress under the cognizance of the Director Defense Test and Evaluation. This effort is oriented toward the evaluation of candidate foreign weapon systems, with the objective of possible future procurement or technology transfer. An active program for the assessment of foreign systems with potential for meeting US requirements is being conducted.

To expedite the process of foreign test data acceptance we expect this year to conclude a Four Power (US, UK, FRG, France) agreement on the mutual acceptance of weapon system test and evaluation results. The objective is to eliminate unwarranted duplication of testing on systems that are being offered by one country for acquisition by another.

Finally, we continue efforts to assist our Allies in improving their T&E processes and in developing and using their test resources. Such assistance is currently being provided to the Republic of Korea, for example.

4. Joint Test and Evaluation Programs. JT&E refers to T&E conducted jointly by two or more DOD components, to evaluate capabilities of developmental and deployed systems in a multi-Service combat arena, to evaluate joint operational concepts and tactics, and to assess interoperability of systems and forces. We have substantially improved the Joint Test and Evaluation (JT&E) management process by establishing an architecture that provides for more participation from the Services in Joint Test nominations, early test design, and lead time to plan and budget for required resources.

In FY 1981, seven JT&Es will be ongoing, and two others will be in the initial stages of activation. Two additional tests will be undergoing feasibility evaluation as possible FY 1982 new starts.

FY 1981 ONGOING AND NEW JOINT TESTS

ONGOING TESTS

Advanced Anti-Armor Vehicle
Counter-Command, Control and Communications
Data Link Vulnerability
Electro-Optical Guided Weapons Countermeasures
Electronic Warfare During Close Air Support
Identification of Friend, Foe, or Neutral
Joint Battlefield Airspace Control

NEW STARTS

Theater Air Defense
Forward Area Air Defense

B. SPACE AND ORBITAL SUPPORT

1. Space Shuttle

We are moving toward the transition of all space system payloads from launch on current expendable boosters to launch on the Space Shuttle after the Shuttle becomes operational in late December 1981. Our primary interest lies in the potential benefits offered by the unique capabilities of the manned, reusable Shuttle. Compared with existing, expendable boosters, the Shuttle will offer increased reliability; increased payload weight and volume capacity; and the capability to recover and refurbish spacecraft for reuse, to conduct on-orbit testing and repair of spacecraft or experiments, and to assemble large structures in space. Most importantly, the Shuttle offers increased flexibility. Coupled with lower projected launch costs, these unique features promise increased effectiveness and economies for our military space operations.

a. IUS

(RDT&E: $77.4 Million, Procurement: $1.7 Million)

The IUS is being developed for use on Shuttle launches to deliver DOD spacecraft to higher orbital altitudes and inclinations than the Shuttle alone provides and will also be used by NASA for synchronous orbit and planetary missions. DOD will also use the IUS on the TITAN III to improve mission success and reduce costs during the early Shuttle transition period. In FY 1981 the two stage IUS development will essentially be completed and IUS development for NASA planetary missions (NASA funded) will continue in order to support a first mission in 1983. The full-scale development activity includes

fabrication of nine pre-production vehicles to support both DOD and civil early operational requirements.

b. Vandenberg Air Force Base (VAFB)

(RDT&E: $93.3 Million, Procurement: $123.0 Million)

We are providing a Shuttle launch and landing capability at VAFB to support high inclination DOD launches. Launches into sun synchronous, polar, or near polar orbits cannot be conducted from KSC without unacceptable performance loss and over-flight of populated land areas during launch. We will phase our capability to conduct Shuttle operations from VAFB starting with an initial capability of six launches per year in December 1983 and building toward a final capability to conduct up to 20 evenly spaced launches per year by mid-1985. This phased approach allows us to incorporate, at VAFB, any changes which may be necessary based on early flight experience at KSC; minimizes early year expenditures while satisfying near term requirements; and assures that the VAFB Shuttle facility will be properly sized to meet national needs.

Shuttle weight growth now dictates thrust augmentation to meet long term performance requirements. Thrust augmentation involves adding strap-on solid motors or liquid propulsion modules to the basic Shuttle configuration. The launch pad and launch mount are being designed to accommodate both configurations.

In FY 1981 VAFB facility construction will continue. FY 1981 MILCON funding for VAFB includes the Solid Rocket Booster Disassembly facility, the Solid Rocket Booster and External Tank Processing facilities, the airfield, logistic support facilities,

relocation of the SAMSO headquarters, and improvement of intrasite transportation routes.

c. Operations Capability Development
(RDT&E: $59.4 Million, Procurement: $30.4 Million)

Other Shuttle activities include preparations for DOD launches at KSC, payload integration, and mission operations capabilities development, including DOD modifications at Johnson Space Center (JSC). DOD planning for early Shuttle launches is based on using NASA's JSC for simulation, training, and Shuttle flight control for all DOD missions. Since the JSC facilities, as presently designed, cannot concurrently handle classified and unclassified payload data we have worked closely with NASA to define modifications needed. A modification approach has been validated that assures minimally adequate protection of DOD classified data and has a minimum impact on concurrent civil space operations. This approach, called the Controlled Mode, is now being implemented. Detailed design modifications of the JSC facilities and procurement of essential additional equipment will continue in FY 1981 in preparation for the first DOD Shuttle launch in 1982. Additional modifications will be made to the existing Solid Motor Assembly Building at KSC to provide a DOD payload servicing and diservicing capabilty. Our FY 1981 MILCON request supports this facility plus security modifications at KSC.

2. Consolidated Space Operations Center (CSOC)
(RDT&E: $13.7 Million)

In the past year we have reexamined present Satellite Control Capabilities at the Satellite Test Center (STC) and investigated

the future need for a dedicated DOD Shuttle control capability. The results of our studies clearly indicated there is a need to augment and backup the STC as well as a requirement for a dedicated DOD Shuttle Control Capability in the future. We have concluded that combining these two capabilities into a Consolidated Space Operations Center (CSOC) will substantially reduce overall costs. The CSOC will enable us to decrease the present vulnerability of the Satellite Test Center, eliminate single critical nodes for both satellite (the STC) and Shuttle (JSC) control, and provide the management and control needed for our military space operations in the post-1985 timeframe.

In FY 1981 detailed design and development activities leading to a mid-1985 IOC for the satellite operations portion of CSOC will be performed. Also, a concept definition phase for Shuttle control will be conducted. We plan to acquire the Shuttle control capability via a phased approach whereby control capabilities are added over time, as needed. This will permit us to incorporate changes and take advantage of cost savings that may become apparent based on early flight experience at JSC.

C. GLOBAL MILITARY ENVIRONMENTAL SUPPORT

1. Objectives

Accurate, reliable meteorological and oceanographic information is essential for the proper execution of our military mission. Weather impacts all phases of the life cycle of a military weapon system from concept and design, through development and testing, and into the planning and employment of the actual system.

2. Management

The combined Federal weather programs for FY 1981 will total approximately $1 billion. The Department of Defense has approximately one-third of the total program. We are structuring our programs to use the total Federal program as a base upon which we can specialize for our military needs. We are cooperating fully with the Office of Management and Budget in the cross-cut review of several aspects of the Federal weather programs. These reviews are being conducted to ensure that the national requirements for weather support, both military and civilian, are being met in a rational, cost-effective manner.

3. Current Service Programs

Each of the Services has major programs to provide weather support for their combat forces. The programs are closely coordinated at OSD level to ensure that the total Defense requirement is met at the lowest cost.

Army combat operations will be enhanced significantly by the introduction of the automatic Atmospheric Sounding Set,

AN/TMQ-31, which is designed to replace the aging rawinsonde equipment presently in use, thereby correcting numerous deficiencies in the field artillery's ability to rapidly acquire atmospheric temperature, humidity, density and winds. In situations where the targets are not visible to observers, this type equipment is the only way of insuring accurate artillery fire. Final engineering development will be completed in FY 1981 and the procurement of the initial 20 units is scheduled for FY 1982. Procurement will be completed in FY 1984 with a total of 95 units.

The Navy has a major program, Tactical Environmental Support System (TESS), designed to develop the capability to predict the performance of sensor and weapon systems as they are influenced by ocean conditions. TESS emphasizes shipboard capabilities but can be expanded where applications indicate to shore installations. This system will incorporate atmospheric and ocean sensors, algorithms to relate the environmental conditions to weapons performance, and display systems to communicate this vital information to the operational decision maker. The system is modular in concept and can be expanded to include additional weapon systems as the technologies permit. Full scale development of the various subsystems is scheduled through 1983 with production and deployment in FY 1984.

The Air Force is initiating a vitally needed advanced development program to provide the ability to observe and collect essential weather information in battle areas which are not under friendly control. This new program will draw on the results of our

technology base programs, initially addressing a wide range of possible data sources, accuracies and availabilities. Low cost, expendable data platforms and remote sensing technologies will be investigated.

4. Interagency Programs

The examples of activities from the Service programs described above all are concerned with the combat forces of the Department of Defense. While that is the most important aspect of the military weather programs, the CONUS infrastructure cannot be ignored.

The weather radars which are currently used by the DoD, National Weather Service and the Federal Aviation Administration are rapidly approaching the end of their useful life. Joint tests conducted by these agencies have shown that Doppler weather radars can be used to warn of severe storms with a greater lead time and lower false alarm rate than existing capabilities. The three agencies are forming a Joint Systems Program Office for the development and acquisition of an operational advanced weather radar system to replace those presently in use. This joint program will significantly enhance our ability for resource protection and ensure a National capability at a minimum cost.

5. Environmental Satellite Program

a. The Defense Meteorological Satellite Program (DMSP)

DMSP supports a wide variety of defense activities from special strategic missions to tactical air operations and anti-submarine warfare to global weather analysis. Following an interagency study, it was decided that the civil and military weather satellite

programs should not be combined but there should be increased coordination and use of common hardware whenever possible. Since the present design is adequate to meet the current needs, and can be modified for shuttle launch, further development of a new spacecraft will be deferred until requirements necessitate a more capable satellite. This may occur if the National Oceanic Satellite System (NOSS) effort is discontinued. The current DMSP spacecraft reliability has exceeded expectations and it has been possible to reduce the total planned procurement of flight units from twelve to ten prior to transition to the Space Shuttle.

b. National Oceanic Satellite System (NOSS)

NOSS is a joint DoD, NASA, NOAA demonstration of system for making operational oceanic observations from space. This Administration initiative implements the President's guidance for a joint civil/military space activity where the objectives of each sector can be satisfied without compromising national policy. Identical projected requirements make a joint effort desirable, as contrasted to the coordinated meteorological satellite programs. The data will directly support naval operations where accurate knowledge of a weapon system's environment can spell the difference between mission success or failure. NASA will be the lead agency for development and procurement of the total system. All three agencies will staff the management team and share the cost of the program. DoD and NOAA will jointly operate the system. We are evaluating the utility of NOSS to determine the extent of our participation beyond FY 1981.

D. TRAINING SUPPORT

1. Objectives

One of the most significant issues facing the military today is our ability to attract, train and retain young men and women to operate and maintain our complex equipment. This problem will become more severe over the next decade because the pool of young people will decrease while military careers do not become more attractive. Therefore, we must increase our efforts to improve ways of training and keeping trained people in the military services.

2. Service Programs

Within the last year, major progress has been achieved with equipment that can speak and recognize spoken words and with computer-based audio-visual devices that can efficiently guide on-the-job maintenance, performance and training. The Services are being asked to develop a broad program which will:

Focus on using emerging technologies, particularly those derived from hand-held computers, for all types of training from the schoolroom to refresher and on-the-job training.

Develop and demonstrate, in operational settings, low cost portable training aids and devices that can be used by individuals away from schools and trained instructors.

Establish an effective watch for innovative technologies which can be applied to problems of personnel and training at the earliest possible opportunity.

APPENDIX

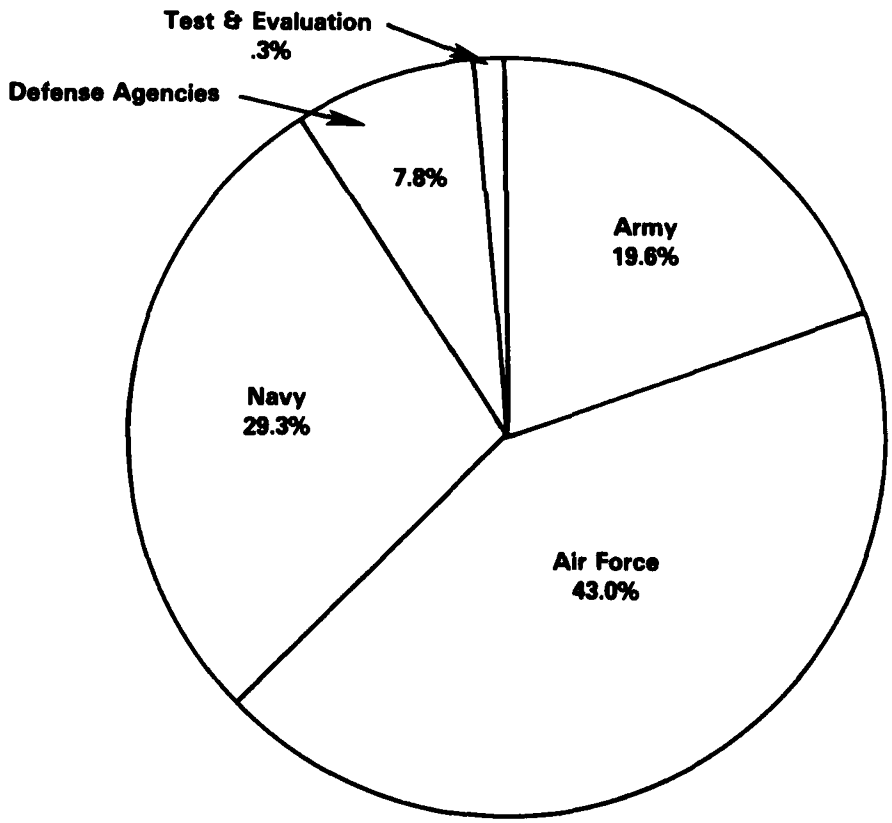
APPENDIX

RDT&E BY COMPONENT

($ MILLIONS)

	FY 1979	FY 1980	FY 1981	FY 1982
Army	2,638.9	2,845.2	3,232.5	3,654.4
Navy	4,464.4	4,566.0	4,836.1	5,211.4
Air Force	4,358.9	5,026.0	7,085.3	8,100.7
Defense Agencies	892.9	1,037.0	1,289.5	1,503.7
Defense Test & Evaluation	27.6	42.5	42.1	55.3
TOTAL RDT&E	12,382.6	13,516.8	16,485.5	18,525.5

FY 1981

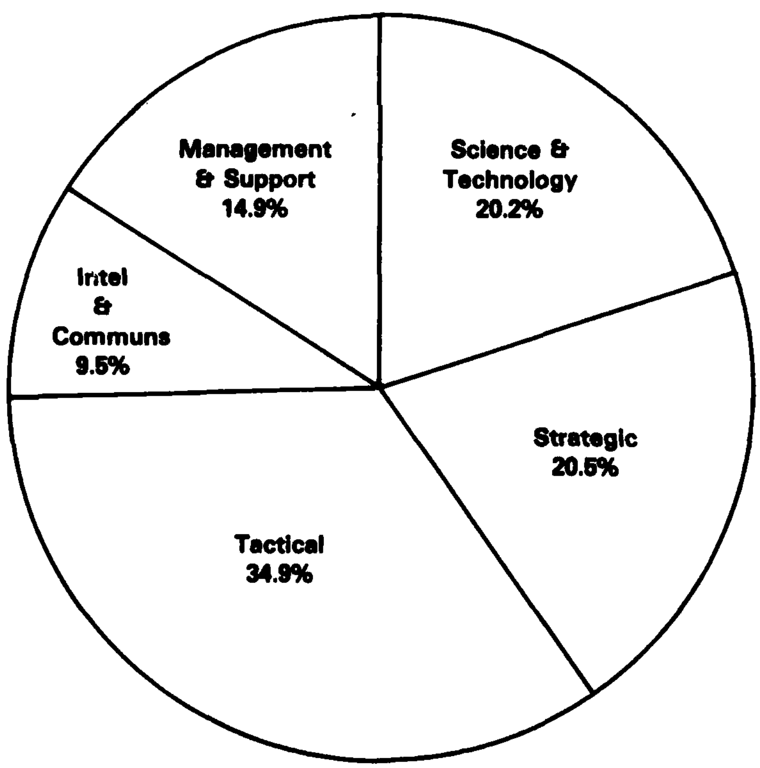


RDT&E BY MISSION CATEGORY

($ MILLIONS)

	FY 1979	FY 1980	FY 1981	FY 1982
Science & Technology Programs	2,534.7	2,898.5	3,336.0	3,929.2
Strategic Programs	2,142.7	2,199.7	3,373.5	4,059.4
Tactical Programs	5,092.9	5,225.2	5,758.0	6,005.2
Defensewide Intel & Communications	758.8	1,162.9	1,571.3	1,778.0
Defensewide Managmt & Support	1,853.5	2,030.5	2,446.8	2,753.7
TOTAL RDT&E	12,382.6	13,516.8	16,485.5	18,525.5

FY 1981

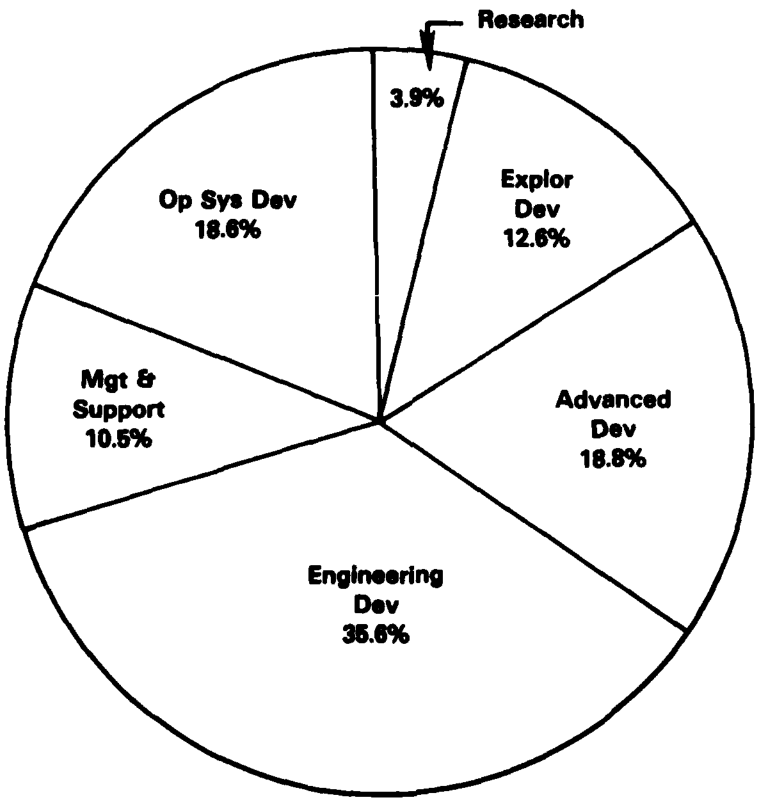


RDT&E BY ACTIVITY TYPE

($ MILLIONS)

	FY 1979	FY 1980	FY 1981	FY 1982
Research	474.7	557.8	651.7	762.0
Exploratory Development	1,535.5	1,702.3	2,072.5	2,324.6
Advanced Development	2,656.6	2,783.4	3,094.8	3,921.4
Engineering Development	4,188.7	4,734.4	5,872.6	6,296.3
Management & Support	1,431.3	1,477.0	1,734.2	1,943.1
Operational Systems Development	2,095.8	2,262.0	3,059.6	3,278.1
TOTAL RDT&E	12,382.6	13,516.8	16,485.5	18,525.5

FY 1981

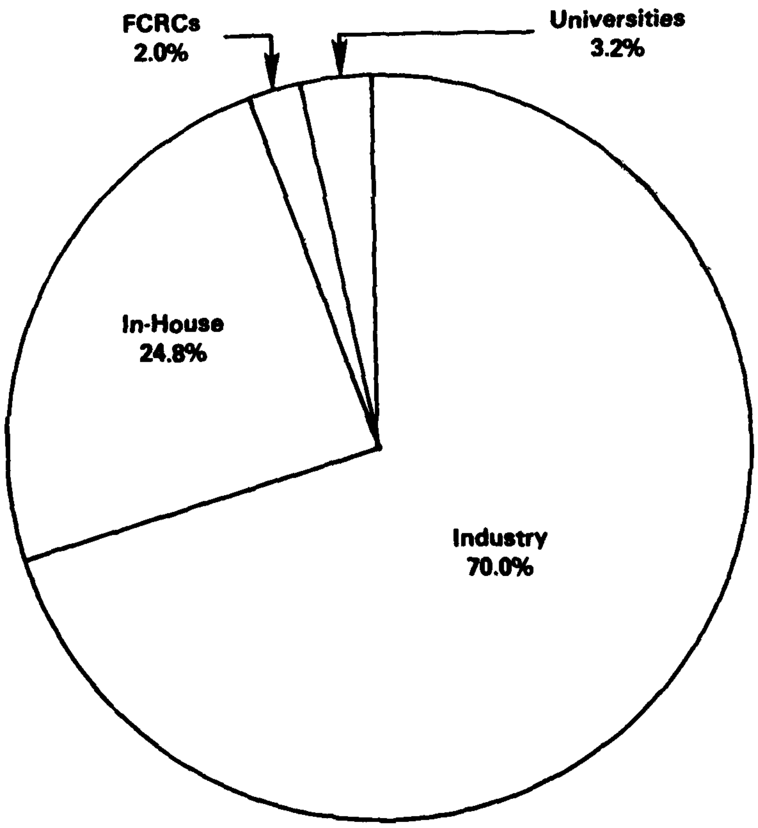


RDT&E BY PERFORMER

($ MILLIONS)

	FY 1979	FY 1980	FY 1981	FY 1982
Industry	8,354.3	9,129.3	11,545.8	13,278.6
Government In-House	3,358.9	3,625.3	4,081.9	4,310.8
Federal Contract Research Centers (FCRC)	259.7	296.2	331.9	364.1
Universities	409.7	466.0	525.9	572.0
TOTAL RDT&E	12,382.6	13,516.8	16,485.5	18,525.5

FY 1981

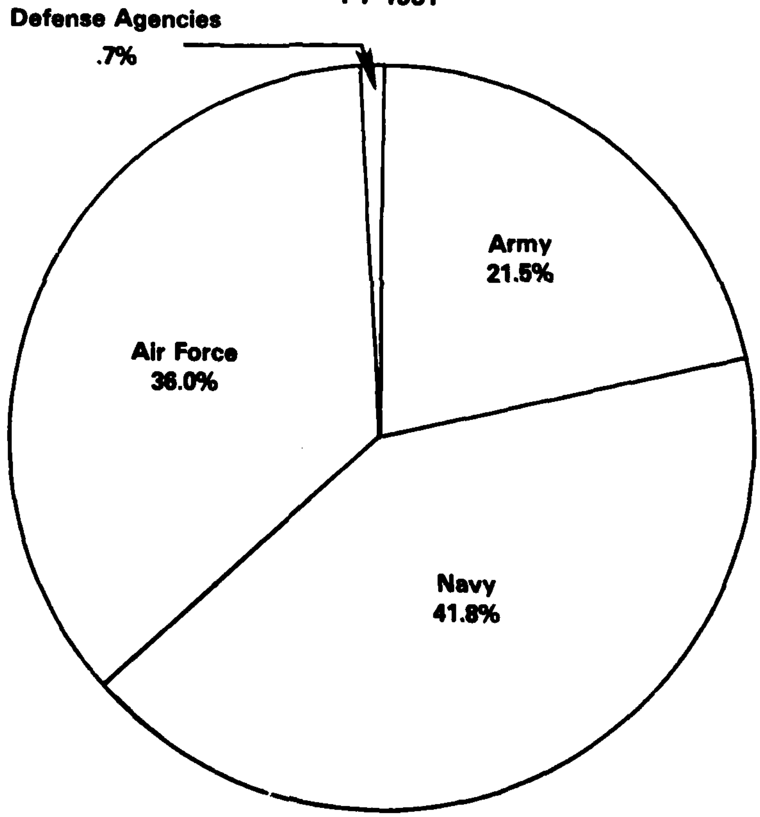


PROCUREMENT BY COMPONENT

($ MILLIONS)

	FY 1979	FY 1980	FY 1981	FY 1982
Army	6,040.6	6,625.6	8,698.8	10,777.7
Navy	14,289.9	15,981.9	16,962.3	20,891.0
Air Force	10,763.1	12,897.9	14,570.0	17,578.6
Defense Agencies	274.6	286.4	302.5	455.6
TOTAL PROCUREMENT	31,368.2	35,791.8	40,523.6	49,702.9

FY 1981



PROCUREMENT BY DEFENSE PROGRAMS

($ MILLIONS)

	FY 1979	FY 1980	FY 1981
Strategic Forces	2,581	4,367	4,906
General Purpose Forces	22,520	24,447	27,192
Intelligence & Communications	2,953	3,277	3,714
Airlift & Sealift	318	376	728
Guard & Reserve Forces	1,510	1,559	1,769
Central Supply & Maintenance	940	1,007	1,229
Training, Medical & Other General Purpose Activities	429	465	508
Administrative & Associated Activities	37	51	100
Support to Other Nations	80	243	378
TOTAL PROCUREMENT	31,368	35,792	40,524

PROCUREMENT BY AUTHORIZATION

($ MILLIONS)

	FY 1979	FY 1980	FY 1981	FY 1982
Aircraft				
Aircraft Procurement, Army	949.7	951.0	925.3	1,402.3
Aircraft Procurement, Navy	4,337.1	4,428.7	4,966.3	6,818.4
Aircraft Procurement, AF	6,937.4	8,082.2	8,555.0	9,475.0
Sub-Total Aircraft	12,224.2	13,461.9	14,446.6	17,695.7
Missiles				
Missile Procurement, Army	761.9	1,162.5	1,501.3	2,274.8
Weapons Procurement, Navy	1,526.3	1,500.3	1,956.6	2,143.1
Missile Procurement, AF	1,473.0	2,183.0	3,042.3	3,916.6
Missile Proc, Marine Corps	23.0	20.5	73.3	108.4
Sub-Total Missiles	3,784.2	4,866.3	6,573.5	8,442.9
Naval Vessels				
Shipbldg & Conversion, Navy	5,072.6	6,682.4	6,118.4	6,921.2
Tracked Combat Vehicles				
Procurement of Tracked Combat Vehicles, Army	1,425.3	1,641.6	2,241.7	2,123.7
Procurement, Marine Corps	25.1	13.0	45.1	200.4
Sub-Total Trkd Combat Veh	1,450.4	1,654.6	2,286.8	2,324.1
Torpedoes & Related Support Equip.				
Weapons Procurement, Navy	321.1	305.1	168.6	152.8
Other Weapons				
Procurement of Weapons & Other Combat Veh, Army	99.1	182.9	387.2	708.4
Weapons Procurement, Navy	75.3	156.8	193.4	176.2
Procurement, Marine Corps	31.1	25.2	42.7	42.9
Other Procurement, AF	.3	—	—	—
Sub-Total Other Weapons	205.8	364.9	623.3	927.5
TOTAL PROCUREMENT (Subject to Authorization)	23,058.4	27,335.2	30,217.2	36,464.2
All Other	8,309.8	8,456.6	10,306.4	13,238.6
TOTAL PROCUREMENT	31,368.2	35,791.8	40,523.6	49,702.8

APPENDIX B: ACRONYMS

AAH:	Advanced Attack Helicopter
AB:	Assault Breaker
ABM:	Anti-Ballistic Missile
ABRES:	Advanced Ballistic Reentry System
ABRV:	Advanced Ballistic Reentry Vehicle
ACAP:	Advanced Composite Airframe Program
ACCAT:	Advanced Command and Control Architectural Testbed
ACM:	Anti-Armor Cluster Munitions
ACMT:	Advanced Cruise Missile Technology
ADCP:	Acquisition and Distribution of Commercial Products
ADPG:	Air Defense Planning Group
AEWTF:	Aircrew Electronic Warfare Tactics Facility
AFSATCOM:	Air Force Satellite Communications
ALCC:	Airborne Launch Control Center
ALCM:	Air Launched Cruise Missile
AMRAAM:	Advanced Medium Range Air-to-Air Missile
ALWT:	Advanced Lightweight Torpedo
AMCM:	Advanced Mine Counter Measures
AMST:	Advanced Medium STOL Transport
ARP:	Anti-Radiation Projectile
ASALM:	Advanced Strategic Air Launched Missile
ASAT:	Anti-Satellite
ASPJ:	Airborne Self-Protection Jammer
ASRAAM:	Advanced Short Range Air-to-Air Missile
ASROC:	Anti-Submarine Rocket
ASUN:	Anti-Surface Ship Warfare
ATA:	Advanced Test Accelerator
ATD:	Advanced Technology Developments
ATGM:	Anti-Tank Guided Missile
AWACS:	Airborne Warning and Control System
BETA:	Battlefield Exploitation and Target Acquisition
BISS:	Base and Installation Security System
BMD:	Ballistic Missile Defense
BMEWS:	Ballistic Missile Early Warning System
BUIC:	Back-Up Intercept Control
BVR:	Beyond Visual Range
C^3:	Command, Control, and Communications
C/C:	Carbon/Carbon
CCR:	Circulation Control Rotor
CEP:	Circular Error Probable
CFV:	Cavalry Fighting Vehicle
CIA:	Central Intelligence Agency
CMCA:	Cruise Missile Carrier Aircraft
CONUS:	Continental United States
CRAF:	Civil Reserve Air Fleet
CSEDS:	Combat Systems Engineering Development Site
CSMS:	Corps Support Missile System
CSOC:	Consolidated Space Operations Center
CTBT:	Comprehensive Test Ban Treaty
CWW:	Cruciform Wing Weapon

DAR	Defense Acquisition Regulation
DARPA	Defense Advanced Research Projects Agency
DEW	Distant Early Warning
DIVAD	Division Air Defense Gun
DNA	Defense Nuclear Agency
DOD	Department of Defense
DRG	Defense Research Group
DSARC	Defense Systems Acquisition Review Council
DSCS	Defense Satellite Communication System
DSP	Defense Science Program
DTOC	Division Tactical Operations Center
ECM	Electronic Counter-Measures
ECCM	Electronic Counter Counter-Measures
ECR	Embedded Computer Resources
EMP	Electro-Magnetic Pulse
ERAM	Extended Range Antitank Mine
ETACCS	European Theater Air Command and Control Study
FAA	Federal Aviation Administration
FAR	Federal Acquisition Regulation
FASCAM	Family of Scatterable Mines
FLIR	Forward Looking Infrared
FPR	Federal Procurement Regulation
FWE	Foreign Weapons Evaluation
GBU	Glide Bomb Unit
GEODSS	Ground Based Electro-Optical Deep Space Surveillance
GLCM	Ground Launched Cruise Missile
HARM	High Speed Anti-Radiation Missile
HEL	High Energy Laser
HOE	Homing Overlay Experiment
IC	Integrated Circuit
ICBM	Intercontinental Ballistic Missile
IEPG	Independent European Program Group
IFF	Identification of Friends or Foes
IFV	Infantry Fighting Vehicle
IIR	Imaging Infrared
IOC	Initial Operational Capability
IPD	Improved Point Defense
IRBM	Intermediate Range Ballistic Missile
IR&D	Independent Research and Development
IRST	Infrared Search and Track
IUS	Inertial Upper Stage
IUSS	Integrated Undersea Surveillance System
IWD	Intermediate Water Depth
JCMC	Joint Crisis Management Capability
JSC	Johnson Space Center
JSS	Joint Surveillance System
JTIDS	Joint Tactical Information Distribution System

LAAAS	Low Altitude Airfield Attack Systems
LANTIRN	Low Altitude Navigation and Targeting Infrared Night System
LAW	Light Anti-Tank Weapon
LDS	Layered Defense System
LOAD	Low Altitude Defense
LPI	Low Probability of Intercept
LRAAS	Long Range Airborne ASW Systems
LUA	Launch Under Attack
LWIR	Long Wave Infrared
MAB	Marine Amphibious Brigade
MANPADS	Man Portable Air Defense System
MCM	Mine Counter Measures
MENS	Mission Element Need Statement
MGT	Mobile Ground Terminals
MHSV	Multi-purpose High Speed Vehicle
MILCON	Military Construction
MIRV	Multiple Independently Targetable Reentry Vehicle
MLRS	Multiple-Launch Rocket System
MMC	Metal Matrix Composite
MMW	Milimeter Wave
MOU	Memorandum of Understanding
MRASM	Medium Range Air-to-Surface Missile
MTP	Manufacturing Technology Program
MX	Missile Experimental
NASA	National Aeronautics and Space Administration
NBC	Nuclear, Biological and Chemical
NGT	Next Generation Trainer
NM	Nautical Mile
OFPP	Office of Procurement and Policy
OSD	Office of the Secretary of Defense
OTH	Over-the-Horizon
OTHB	Over-the-Horizon Backscatter
PAPS	Periodic Armaments Planning System
PARCS	Perimeter Acquisition Radar Characterization System
PB	Particle Beam
PGM	Precision Guided Munitions
PLSS	Precision Location Strike System
PLU	Preservation of Location Uncertainty
POL	Petroleum Oil and Lubricants
PNVS	Pilot Night Vision System
PSP	Programmable Signal Processor
PTV	Propulsion Technology Validation
RAP	Rocket Assisted Projectile
RAWS	Remote Area Weather Station
R&D	Research and Development
RD&A	Research Development and Acquisition
RDT&E	Research Development Test and Evaluation
REMBASS	Remotely Monitored Battlefield Sensor System
RF	Radio Frequency
RLG	Ring Laser Gyro

ROCC	Region Operations Control Center
RPV	Remotely Piloted Vehicle
RSI	Rationalization, Standardization and Interoperability
RSP	Rapid Solidification Processing
RV	Re-entry Vehicle
SACDIN	Strategic Air Command Digital Information Network
SAGE	Semi-Automatic Ground Environment
SALT	Strategic Arms Limitation Talks
SAMS	Surface-to-Air Missile
SAMSO	Space and Missile System Organization
SED	Sensor Evolutionary Development
SGEMP	System Generated EMP
SIAM	Self-Initiated Anti-Aircraft Missile
SLBM	Submarine Launched Ballistic Missile
SLCM	Submarine Launched Cruise Missile
SLMM	Sub-Launched Mobile Mine
SOTAS	Stand Off Target Acquisition System
SPADOTS	Spare Detection and Tracking System
SRAM	Short Range Attack Missile
SSBN	Nuclear Powered Ballistic Missile Submarine
SSURADS	Shipboard Surveillance Radar Systems
S&T	Science and Technology
STC	Satellite Test Center
STP	Systems Technology Program
STR	Systems Technology Radar
SUAWACS	Soviet Union Airborne Warning and Control System
SURTASS	Surveillance Towed Array Sensor System
SXTF	Satellite X-Ray Test Facility
TADS	Target Acquisition and Designation System
TEL	Transporter Erector Launcher
TERCOM	Terrain Contour Matching
TGSM	Terminally Guided Submunitions
TLAM	Tomahawk Land Attack Missile
TALCM	Tactical Air Launched Cruise Missile
TACTAS	Tactical Towed Array Sonar
TNF	Tactical Nuclear Forces
TNW	Tactical Nuclear Warfare
$TNFS^3$	Theater Nuclear Forces, Survivability, Security and Safety
TRI-TAC	Joint Tactical Communications Program
USAF	United States Air Force
VAFB	Vandenberg Air Force Base
WAAM	Wide Area Anti-Armor Munitions
WVR	Within Visual Range
WP	Warsaw Pact
WWMCCS	Worldwide Military Command and Control System

FILM

8